PIT AND QUARRY

AUG - 5 1940

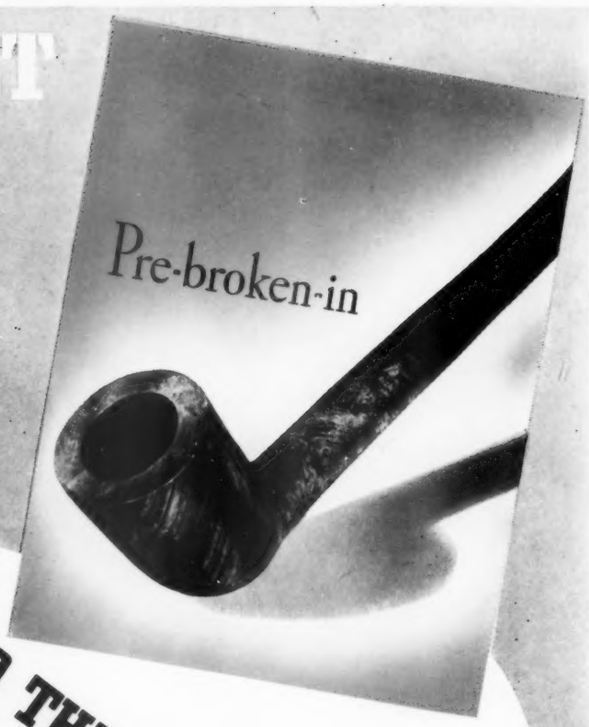
AUGUST, 1940

Aggregates Production for Santee-Cooper Dam and the Pennsylvania Turnpike . . . Obsolescence in the Lime Industry . . . Newer Explosives Cut Blasting Costs . . . New Cement Specifications

HAZARD LAY-SET

Preformed

...IS PRE-BROKEN-IN TO THE JOB



● When you put Hazard LAY-SET Preformed on the job there is no need to "baby" it until it is "broken-in." Hazard LAY-SET Preformed is preformed at the mill—pre-trained to the job.

Take this single example for instance. Closing lines on some clamshell buckets must take terrific beatings because of small sheaves and reverse bending. It is in such places that LAY-SET Preformed proves its merit right from the start.

LAY-SET has the stamina to endure the punishment *much* longer than ordinary wire rope. That means fewer shutdowns, fewer rope replacements, steadier production, greater profits.

Write today to the Hazard district office nearest you and ask for the name of your nearby Hazard distributor. He will show you how to effect real economies in your machinery operation. All Hazard ropes made of Improved Plow Steel are identified by the Green Strand—and Green Signifies Safety.

HAZARD WIRE ROPE DIVISION

Established 1846

AMERICAN CHAIN & CABLE COMPANY, INC.

WILKES-BARRE, PENNSYLVANIA

District Offices: New York, Chicago, Philadelphia, Pittsburgh, Fort Worth, San Francisco, Denver, Los Angeles, Atlanta, Tacoma

Check These Link-Belt Features

FOR EFFICIENT BELT CONVEYOR OPERATION

1. Anti-Friction Efficiency. Roller bearings take high radial and thrust loads.

2. Strength and Simplicity. Riveted frame, strong brackets and sturdy rolls make a trouble-free assembly. No bolts or nuts to work loose.

3. Ease of Lubrication. High-pressure grease system is highly accessible and bearings are protected by labyrinth seals which retain grease and keep out dirt.

4. Belt Protection. Idlers are smooth with rounded edges. Narrow gap between rolls prevents pinching.

5. Accurate, Balanced Rolls. Accurate machining assures perfect alignment of bearings and uniformity of parts in the complete idlers.

Heart of the efficient belt conveyor of today is the idler. To this all-important element Link-Belt has given continuous attention as a result of which present Link-Belt designs offer the most in dependability and low service cost.

Get information now on better belt conveyor equipment—whether for modernization or new installation needs.

LINK-BELT COMPANY
The Leading Manufacturer of Equipment for Handling Materials and Transmitting Power 8171B
INDIANAPOLIS CHICAGO PHILADELPHIA ATLANTA
DALLAS SAN FRANCISCO TORONTO
Branch offices and warehouses located in all principal cities

LINK-BELT

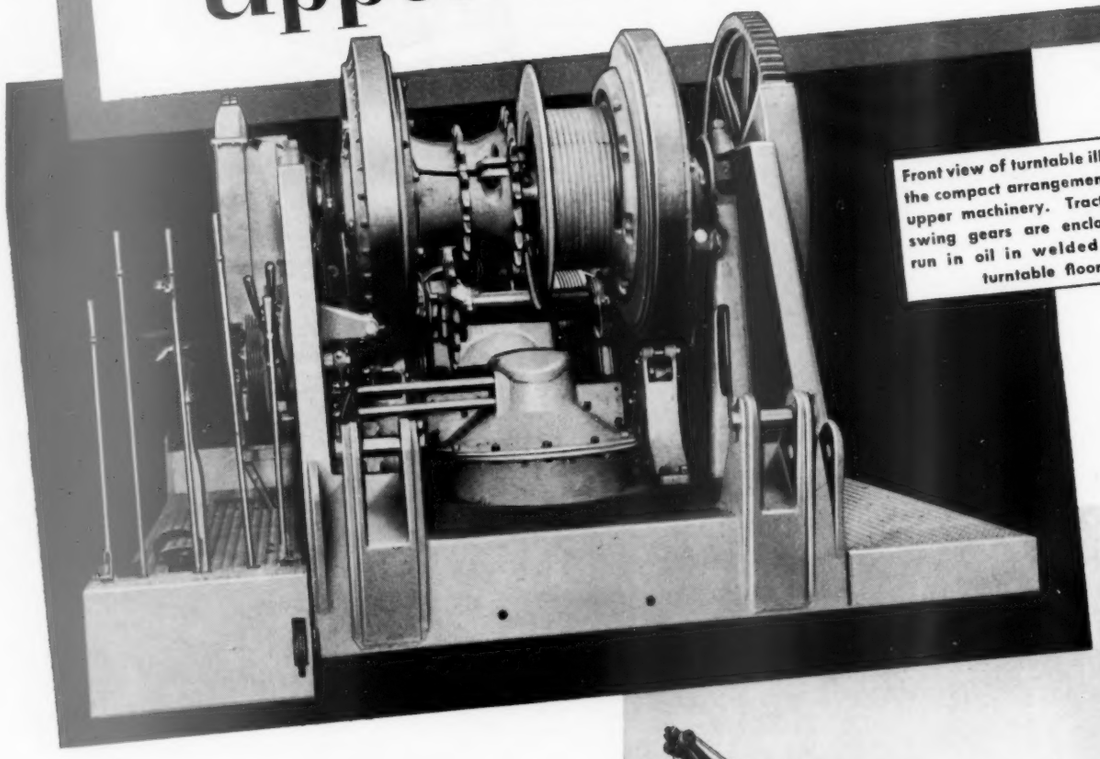
A TYPE FOR EVERY SERVICE

BELT CONVEYOR EQUIPMENT

IDLERS • TRIPPERS • BELTS • PULLEYS • BEARINGS • TAKE-UPS • DRIVES

PIT AND QUARRY, August, 1940, Vol. 33, No. 2. Published monthly by the Complete Service Publishing Company, 538 South Clark Street, Chicago, Ill. Subscription price $1 for 1 year in the U.S. and possessions, Canada, Central and South America; elsewhere $1 additional for each year. Single copies 20 cents. Entered as second-class matter February 28, 1932, at the Post Office at Chicago, Ill., under the act of March 3, 1897.

Simple and Compact Upper Machinery



Front view of turntable illustrates the compact arrangement of the upper machinery. Traction and swing gears are enclosed and run in oil in welded case on turntable floor.

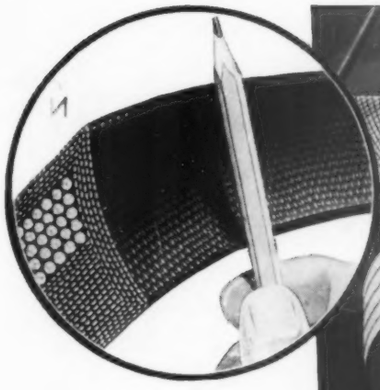
Simplicity Reduces Repair Bills

Profit-earning depends on high-speed production and *low repair bills.* Simple design and construction of the most important machinery . . . the upper machinery . . . on Koehring 604 Excavators, keeps repair costs low. Enclosed gears running in oil, anti-friction bearings and small number of operating parts . . . easily accessible for operating adjustment . . . are important reasons why Koehring Excavator maintenance costs do not wipe out the job-profit.

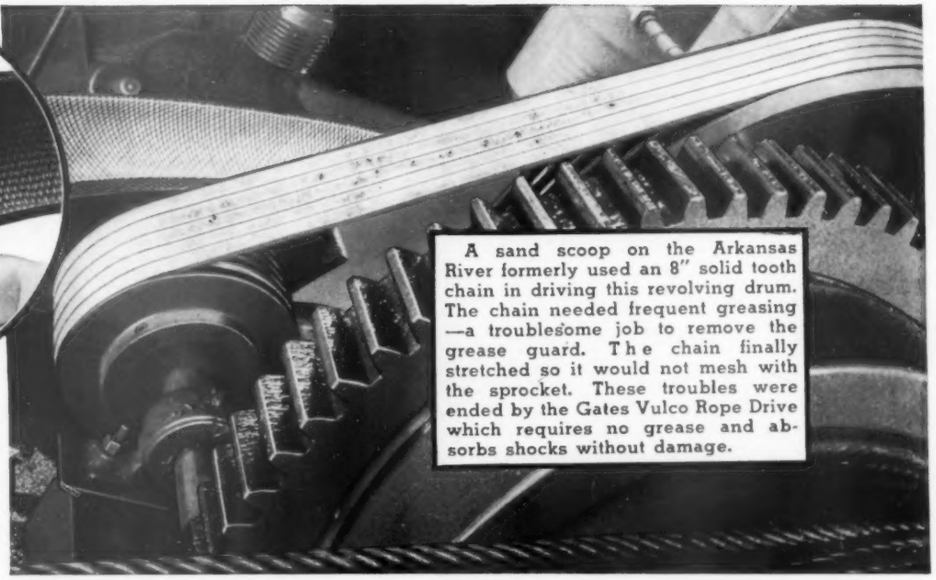
KOEHRING COMPANY
MILWAUKEE, WIS.

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT



The **Concave Side** IS A GATES PATENT



A sand scoop on the Arkansas River formerly used an 8" solid tooth chain in driving this revolving drum. The chain needed frequent greasing —a troublesome job to remove the grease guard. The chain finally stretched so it would not mesh with the sprocket. These troubles were ended by the Gates Vulco Rope Drive which requires no grease and absorbs shocks without damage.

Learn of a SUBSTANTIAL SAVING in BELTS and POWER by making This Simple Test

What Happens When a V-Belt Bends

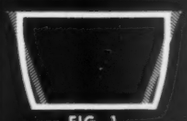


FIG. 1

FIG. 2

Grip with your fingers the sides of any V-Belt; then bend the belt and feel the sidewall change shape. Being under tension, the top of the belt narrows. The bottom, compressed, becomes wider. The sidewalls bulge. These stresses distort a straight-sided V-belt into a shape that does not fit the sheave groove—as shown in Figure 1 (on the left). Note the out-bulge of the sides.

Now bend a V-belt built with the patented concave side. You'll feel the same stresses, the same shape change with this big difference: the altered shape exactly fits the sheave groove—as shown in figure 2. Two advantages result. (1) No sidewall bulge; therefore uniform sidewall wear; longer life! (2) Full sidewall grip on the pulley; therefore less slippage on heavy loads or sudden load increases—a saving in belt wear and also in POWER.

The Gates Vulco Rope is the only V-Belt built with the patented concave side.

V-Belt in Sheave

It's the sides of a V-Belt that do all the gripping and get all the wear. That's why longer life for the sides means longer life for the belt.

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

CHICAGO, ILL., 1524 South Western Ave. HOBOKEN, N. J., Terminal Building BIRMINGHAM, ALA., 1631 1st Ave., S. LOS ANGELES, CAL., 2240 E. Wash. Blvd.

DENVER, COLO., 999 South Broadway DALLAS, TEX., 2213 Griffin Street PORTLAND, ORE., 333 N. W. 5th Ave. SAN FRANCISCO, CAL., 2700 16th St.

IN THE TIMKEN REMOVABLE ROCK BIT

THE shoulder takes the shock. There is definite clearance between the end of the steel and the bottom of the bit. The function of the threads is only to hold the bit on the steel. The contour is streamlined. The bit is uniformly deep hardened. It is made of world-famous TIMKEN Electric Furnace Alloy Steel. To the user these features mean: (1) absence of "bottoming", (2) easy removability, (3) less "stuck" steel, (4) more footage per bit, (5) faster cutting—in short, drilling costs reduced to the lowest levels ever recorded.

A FULL COMPLEMENT OF TIMKEN BITS FOR EVERY DRILLING JOB

The TIMKEN "H" Series Bit. A general purpose bit for contracting, mining, and quarrying to be used with light and medium weight drills. Comes in either side or center hole in sizes from 1⅜" to 2⅝" gauge inclusive.

The TIMKEN "M" Series Bit. The "M" Bit is an intermediate type recommended when the "H" series proves too light and the heavy duty "D" series is not required. The "M" Bit is manufactured only with a center hole and is available in a limited range of sizes including 2", 2⅛", 2¼" and 2⅜".

The TIMKEN "R" Series Bit. Often referred to as the "rose" bit, the "R" series is used in soft formations like limestone and sandstone. It comes in either side or center hole in gauges 1⅜" to 2⅛" inclusive.

The TIMKEN "J" Series Bit. This type if often called the "chisel" bit. It is designed for hard formations and ravelled rock. It is furnished with side hole only in sizes from 1⅜" to 2½" inclusive.

The TIMKEN "D" Series Bit. A heavy section bit for heavy mining and general quarrying to be used on wagon drills and tripod drills or other applications where large sections of drill steel and heavy machines are required. This bit comes in either side or center hole in sizes from 1¾" to 3" gauge inclusive.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN
ROCK BITS

Back with a BANG!

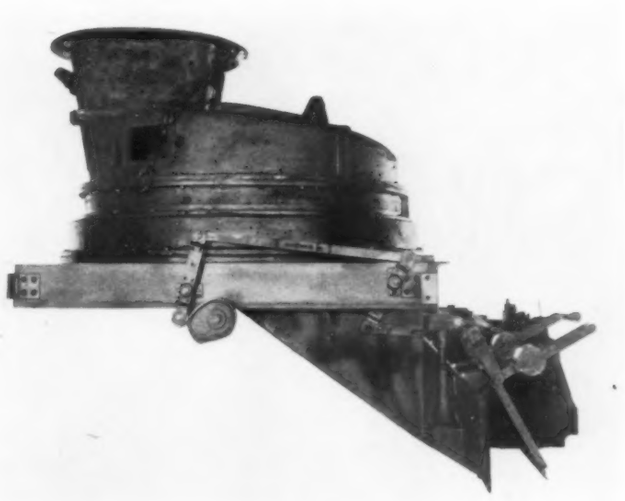
● AFTER EXTENSIVE PREPARATIONS
McGann Manufacturing Company
REORGANIZES TO OFFER THE LIME INDUSTRY EQUIPMENT FOR EVERY NEED

Plus a Sensational New Development—
THE YORK-KUNTZ CONTINUOUS LIME KILN

● *Continuous Feed and Continuous Discharge* . . . Apparatus shown at the right. For today's fast production, this exclusive system gives exact control of all operations, providing Regulated Burning. Eliminates hazards of over-burning or under-burning and lost time, and saves money throughout the process.

With "CENTRAL DRAFT CONTROL"

This noteworthy feature assures equalization of temperatures in the burning area . . . positive heat distribution . . . and an amazingly efficient ratio of lime to fuel.



A Special Message from William J. Kuntz to You . . .

"It is a great pleasure to announce the revitalization of the McGann Company to serve our many friends, old and new. After 40 years' experience in this business, I can truthfully state that our products offer exclusive advantages learned through observation of plants all over the world . . . the greatest storehouse of experience in the entire industry."

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Lime & Hydrate Plants Co.
York, Pa.—and the
L. R. Christie Co. of
Pittsburgh, Pa.
for better service to all

OUR ORGANIZATION STANDS READY TO SERVE THE INDUSTRY . . . WRITE, PHONE, OR WIRE US TODAY

McGANN MANUFACTURING CO., INC.
William J. Kuntz, President
Offices and Works
YORK • PENNSYLVANIA • U. S. A.
• Complete Design, Manufacturing, and Erection Facilities

Rough and Ready — and a swell looker!

THERE'S a brutish beauty about a unit like the Ford in this picture — a feeling of massiveness and strength held within clean lines. It takes your eye.

But it gives you a powerful respect for its downright ruggedness too. It tells you again what you already know — that you can count on a Ford to *stand up* on daily jobs that might take the heart right out of a unit less solidly built, less skilfully and honestly engineered.

And there's that important word, *economy*. Ford Trucks can save money for you in more ways than one. They're easy on oil and gas. They don't cost much to begin with and they bring a high consideration from any Ford dealer when it's time to trade them in. They last a long while.

If you haven't operated a Ford for the past few years, maybe you don't know what you're missing. These '40s are walloping big values — the best we've ever built. Ask your Ford dealer about an "on-the-job" test — a free demonstration of full-load performance, over your routes, with your own man at the wheel.

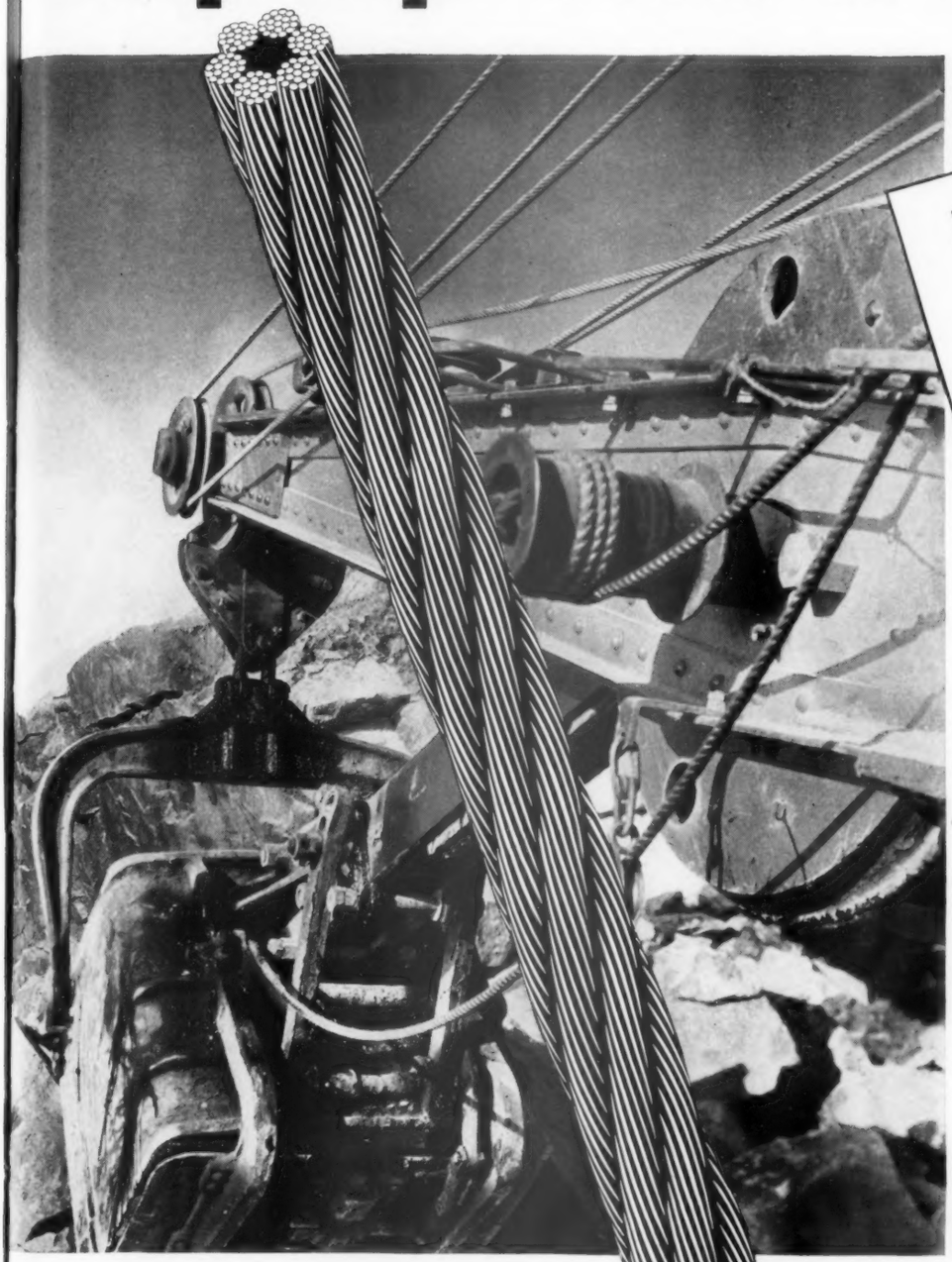
Ford

FORD TRUCKS AND COMMERCIAL CARS

★ FORD MOTOR COMPANY, BUILDERS OF FORD V-8 AND MERCURY CARS, FORD TRUCKS, COMMERCIAL CARS, STATION WAGONS AND TRANSIT BUSES

Visit the new Ford Expositions at the two Fairs, New York and San Francisco, 1940

Strip Rope Costs to the Bone...

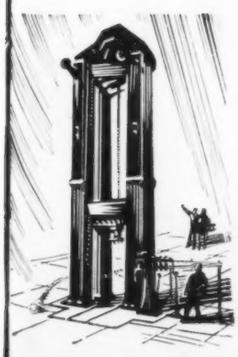


ROEBLING
"BLUE CENTER"
WIRE ROPE
STANDARD OR PREFORMED

Every dollar saved counts in digging and handling sand, gravel, crushed stone, and other materials. That is why an ever-increasing number of concerns are taking advantage of the cost-cutting ability of Roebling "Blue Center" Wire Rope.

First of all, "Blue Center" is the finest of all Roebling Wire Ropes. It represents the highest achievement of all Roebling's research and manufacturing efforts. It has been developed with the one idea of producing a super-quality rope—one which will assure the maximum of durability, safety and economy in rope service. Made of famous Roebling acid open-hearth steel—it provides the highest degree of resistance against abrasion, fatigue and sudden shocks.

You can easily prove the cost-cutting and safety advantages of Roebling "Blue Center" Wire Rope. Install "Blue Center" when you re-rope your equipment. Keep accurate service records. Compare. Then, you be the judge.



A "TOWER OF TORTURE" FOR WIRE ROPE!

This machine is typical of the costly and exceptional testing equipment employed by Roebling to make certain that Roebling "Blue Center" Wire Rope measures up to the exacting standards set for it. This equipment has a capacity of 2½ million pounds—is capable of pulling apart a steel bar 6 inches square.

JOHN A. ROEBLING'S SONS CO.
Trenton, N. J. Branches in Principal Cities

ROEBLING "BLUE CENTER"... The Finest of all Roebling Wire Ropes

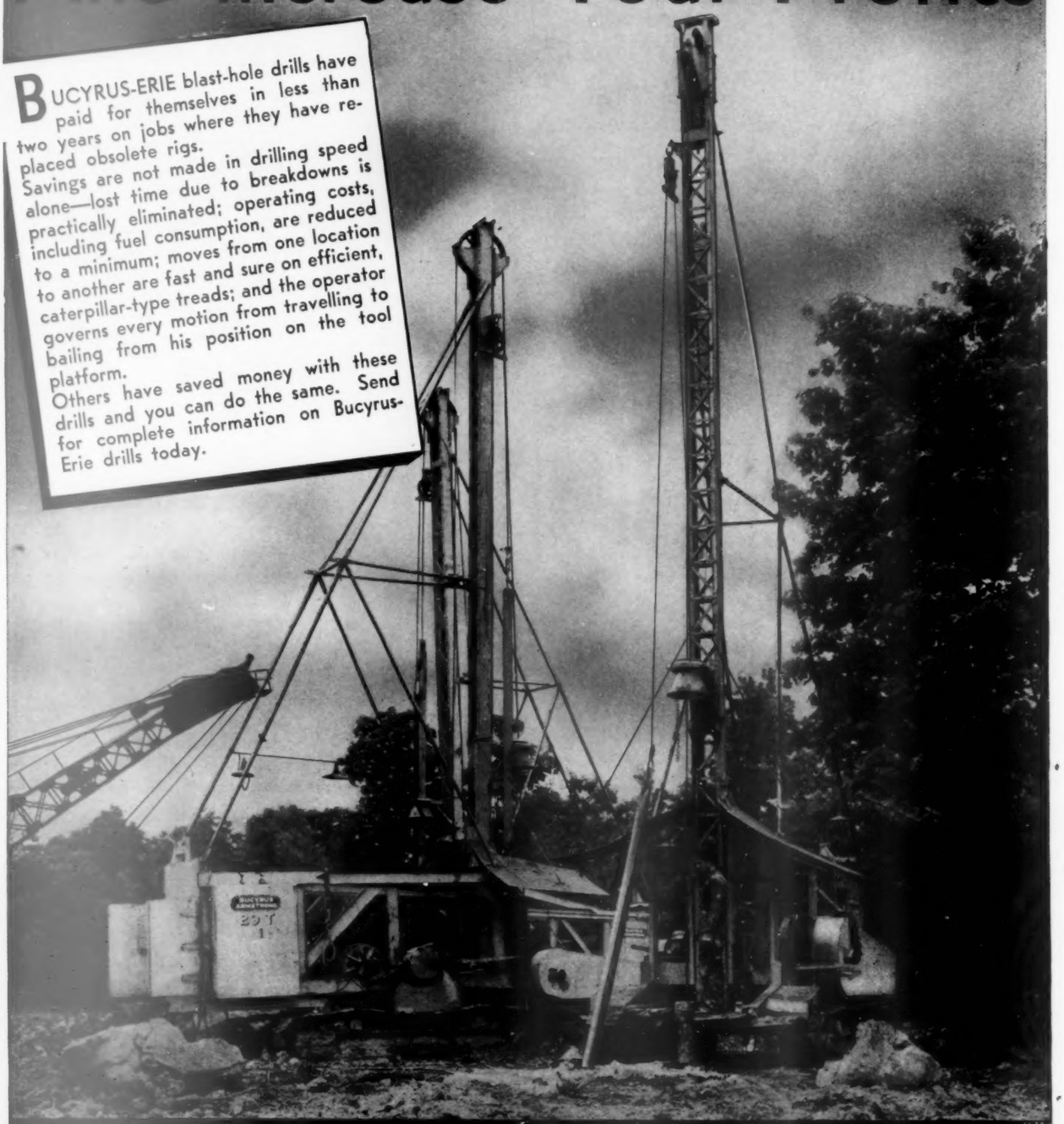
MODERNIZE

And Increase Your Profits

BUCYRUS-ERIE blast-hole drills have paid for themselves in less than two years on jobs where they have replaced obsolete rigs.

Savings are not made in drilling speed alone—lost time due to breakdowns is practically eliminated; operating costs, including fuel consumption, are reduced to a minimum; moves from one location to another are fast and sure on efficient, caterpillar-type treads; and the operator governs every motion from travelling to bailing from his position on the tool platform.

Others have saved money with these drills and you can do the same. Send for complete information on Bucyrus-Erie drills today.



BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE, WISCONSIN

Bethlehem's recently completed movie on wire rope manufacture will prove interesting and informative for a distributor get-together, a meeting of an engineering or industrial group—or for any gathering of people interested in knowing how the wheels go 'round in the nation's basic industry.

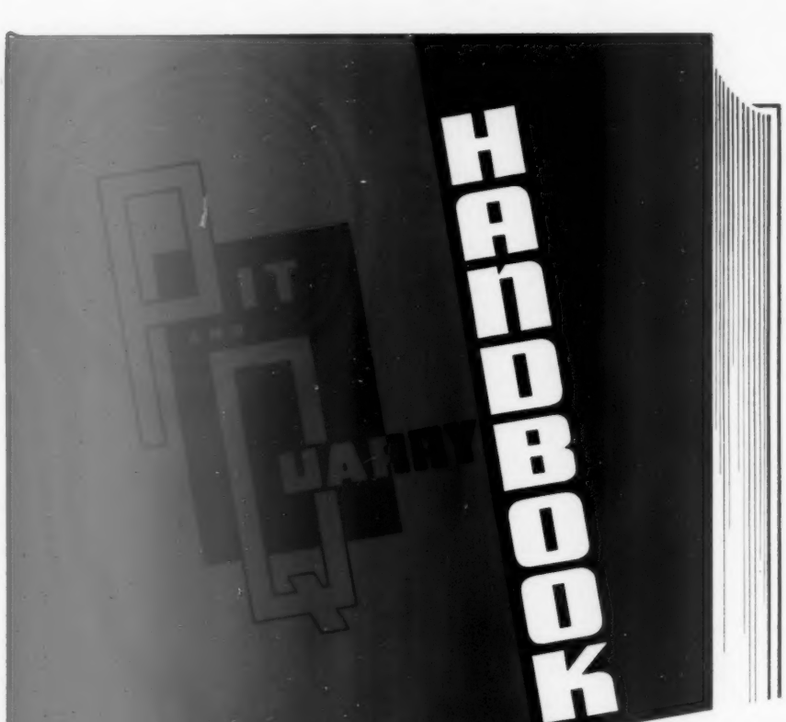
It is a graphic portrayal of Bethlehem's million dollar mill improvement plan, carried out in order to increase still further the quality and uniformity of Bethlehem Wire Rope. You see the new, modern equipment, including the giant machines that make the largest sizes, busily at work turning out Purple Strand and other Bethlehem Ropes.

"Sinews of Steel" is an adventure in one of America's largest workshops—the steel and wire-rope mills of Bethlehem Steel Company. The picture gives a swift, vivid portrayal of the steel-making process, shows how the wires are drawn from rods, then woven into sinews of steel. You see tons of white-hot metal pouring from huge ladles. You see giant rolling mills squeezing ingots like cheese. You see high-speed wire mills reducing rods to thread-like high-strength wire. You get the exciting inside story on how Bethlehem builds wire rope for every type of job.

Don't miss "Sinews of Steel." If you'd like to show it before any sort of actively interested group write to Bethlehem Steel Company, Bethlehem, Pa. Bookings are now being arranged throughout the country.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL



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Don't Waste Your Time and Postage on an Old List

The compilers of the 1940 Directory Section of Pit and Quarry Handbook have labored painstakingly to build an accurate list of all known American producers of nonmetallic minerals. Each new listing has been carefully scrutinized for accuracy and completeness. Previous listings have been revised, checked, double-checked. All appear two ways—(1) alphabetical by companies, (2) geographical by plants. It gives you company names, officers, location of plants, size or capacity, and names of the men who do the buying. Select the complete Handbook *and* Directory, or the convenient, flexibly-bound Directory alone. Now ready for distribution. Order NOW to insure getting one of the first copies. Use coupon below . . . we'll bill you after you get the book.

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Name ..... Title.....

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Town ..... State.....

OHIO GRAVEL Co.

CINCINNATI, OHIO

makes it five

NORTHWESTS

ASK yourself—would you buy another machine of the same make if your first had not been eminently satisfactory? No, you wouldn't! Neither would the hundreds of Northwest owners who have been repeat order buyers.

Northwest repeat orders form an incontrovertible story of satisfactory service—a testimonial to Northwest performance that can't be overlooked.

Five Northwests for the Ohio Gravel Co. in less than ten years is the best possible assurance that Northwests in *your* pit are going to turn out more for less. Northwest shovels and cranes bring you advantages that make them *real* rock shovels! There is a size for every pit problem.

—AND IT'S A REAL ROCK SHOVEL!

NORTHWEST ENGINEERING COMPANY
1822 Steger Building • 28 East Jackson Boulevard
CHICAGO, ILLINOIS

Shovels • Cranes • Draglines • Pullshovels

"MR. OTT, HAVE YOU EVER HEARD OF FLEET ANGLE?"

EXCELLAY *Preformed* WIRE ROPE

IMPROPER fleet angles cause wire rope to rub against the flange of the lead sheave and to side-swipe and pinch against adjacent rope winds on the drum. Experience has proved that you get most satisfactory service when maximum fleet angle is not more than 1½ degrees. That is equivalent to forty feet of lead for every foot of transverse travel to either side of the sheave centerline.

Be sure that all sheaves and drums are properly aligned. Otherwise, excessive flange and rope wear are certain to result. Another common cause of premature rope failure is reverse bending. Wherever possible, avoid reverse bends. If the equipment cannot be altered to eliminate them, use sheaves of the largest possible diameter to ease the severity of bending.

Don't let these faults in reeving rob you of the performance that is built into high-quality wire rope. Correct them now, and you'll begin at once to get the benefits of longer rope life and better all-round performance. Ask an American Tiger Brand Wire Rope Engineer to go over your equipment and make recommendations.

FROM THE DAILY REPORT
OF A TIGER BRAND
WIRE ROPE ENGINEER

Mr. Ott was burned up. "What kind of rope do you call that—practically new and yet it's all chewed up!"

It wasn't hard to see the trouble. The drum was too close to the lead sheave. When reeving on the ends of the drum, the rope rubbed hard against the sheave flanges. So I said to him, "Mr. Ott, have you ever heard of fleet angle?"

"Sure," he said, "but what's that got to do with me?"

"Everything," I said. "That's the whole trouble. Either use a drum with shorter travel, or move the lead sheave up so the maximum fleet angle will be 1½ degrees. I'll lay you two to one that'll step up your rope life at least 50 per cent.

Yours,

al

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York

COLUMBIA STEEL COMPANY
San Francisco

United States Steel Export Company, New York

UNITED STATES STEEL

DEPENDABLE
DU PONT DETONATORS

Don't run the risk of prematures. Remember—the most dependable detonator is the safest detonator

THIS ALUMINUM FOIL SHIELDED SHUNT comprises an outer layer of thin aluminum and an inner layer of highly efficient insulating material. It holds the leg wires tightly together for their entire bared length, thus forming a complete short circuit. The insulating layer protects the short-circuited ends from outside currents. To remove the shield, simply pull the leg wires apart.

THIS PAPER BAND holds the cap wires in a convenient figure 8 fold. No tangling, snarling or kinking. When the band is torn, the natural resilience of the wires makes it easy to straighten them out in the desired manner.

YEAR IN, YEAR OUT, Du Pont detonators continue to lead the parade—in winning new customers, in keeping satisfied customers coming back for more. And for a two-word reason: *Dependable performance*.

Behind every box of Du Pont detonators and other firing devices—blasting caps, electric blasting caps, squibs, delay ignitors—stands the Du Pont reputation for manufacturing accuracy. And this reputation brings you the feature you need most of all: uniform dependability.

Since 1802—138 years—Du Pont has been developing, manufacturing and selling explosives and blasting accessories. And when you buy from Du Pont, you get products not only made from the finest quality materials, but with an ingredient only Du Pont can supply: these long years of experience.

With so much at stake—both safety and cost—in every blast, isn't it good business to insist on the utmost in detonator dependability? And that's the reason why Du Pont customers have used more than FOUR BILLION Du Pont detonators.

• • •

E. I. DU PONT DE NEMOURS & CO. (INC.)
Explosives Department Wilmington, Delaware

Visit the Du Pont "Wonder World of Chemistry" Exhibits at the New York World's Fair and on the Boardwalk at Atlantic City

DU PONT EXPLOSIVES *and* BLASTING ACCESSORIES

TWO GREAT BIG ADVANTAGES

On the one hand . . .

Greater Safety

Atlas Manasite Detonators have been accepted as a great advance in safer blasting. Through reduced sensitivity to impact and friction, they make safety precautions not less important but more effective than ever. Laboratory tests and field experience both prove that Atlas Manasite Detonators are great aids to safety practices.

On the other . . .

Dependability in Action

Blasters who try Atlas Manasite Detonators continue to use them. More than 80,000,000 have been used—proof aplenty of dependability. Yet they cost no more. Are you using Atlas Manasite Detonators?

Your Atlas representative has full details. He'll be glad to call at your convenience.

ATLAS MANASITE DETONATORS

Another "ATLAS FIRST"

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

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Seattle, Wash.
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ATLAS

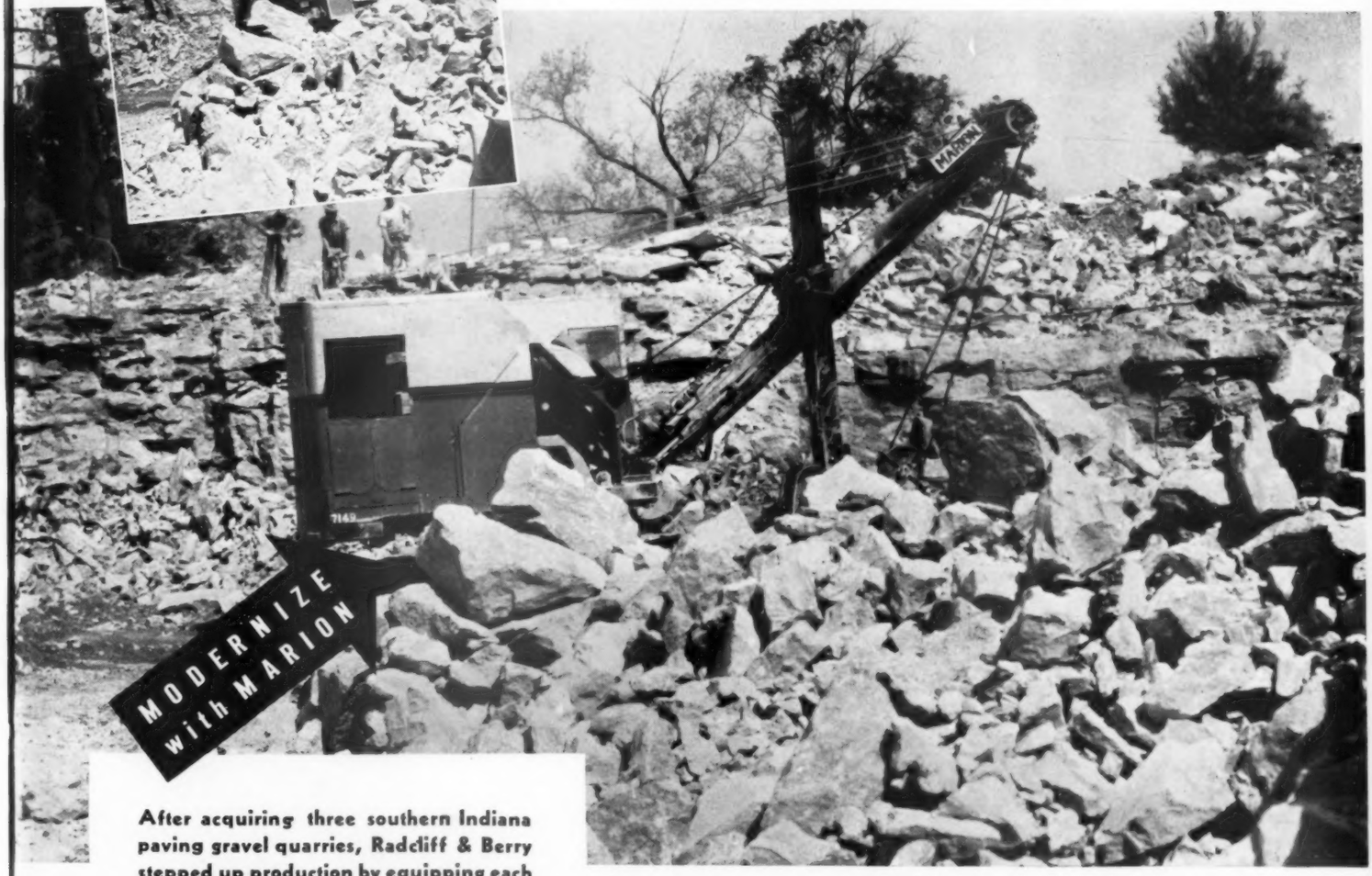
EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

3 MARIONS speed up Quarry operations for RADCLIFF & BERRY

This Marion Type 331 ¾ cu. yd. shovel recently loaded 1062 tons of crushed stone in a 7½ hour day. » » »

Tonnage was doubled at the Charlestown quarry by the addition of this Marion ¾ cu. yd. shovel.



After acquiring three southern Indiana paving gravel quarries, Radcliff & Berry stepped up production by equipping each of their properties with ¾ cu. yd. Marion shovels to handle the digging and loading. ● The efficiency of your quarry can also be greatly increased by changing to the modern Marion quarrying methods. An investigation today will pay you extra profits tomorrow. » » »

THE MARION STEAM SHOVEL COMPANY
MARION, OHIO, U. S. A.

MARION

SHOVELS • DRAGLINES • CLAMSHELLS
CRANES • PULL-SHOVELS • WALKERS

From ¾ cu. yd. to 35 cu. yds.
Gasoline - Diesel - Electric

TONNAGE for the TURNPIKE

SUPER HIGHWAY CONSTRUCTION DEMANDS SUPER-PERFORMANCE

CEDARAPIDS PORTABLE ROCK PLANT, owned by The Concrete Materials and Construction Company, crushed, screened and washed 130,000 tons of hard blue limestone for the Pennsylvania Turnpike job. This Cedarapids plant demonstrated a capacity of 150 tons per hour of finished aggregate in sizes 2½" to 1¼" and from 1¼" to ¼". Because of this super-tonnage the Cedarapids plant played its part in speeding up completion of this super-highway. Such super-performance was possible because of these outstanding features of the Cedarapids Portable Rock Plant: ● Portability ● Low Maintenance Cost ● Big Capacity ● Long Life ● Quick Field Set-up ● Fast Moves ● Easy Adaptation to Pit Conditions.

No matter what your requirements—large or small tonnage—there is a Cedarapids Portable or Stationary Plant that will do the job faster and at lower cost. There is a complete line of Cedarapids Portable or Stationary Crushing Plants, Washing Plants, Bituminous Mixing Plants and Material Handling Equipment from which to choose the plant you need. Tell us your production problems. Write today.

1. Primary Unit: 25" x 40" Jaw Crusher and Rock Feeder.
2. Secondary Unit: 40" x 24" Roll Crusher and Screen.
3. Sizing Unit: Scrubber, Finished Sizing Screens and Bins.

IOWA MANUFACTURING COMPANY, Cedar Rapids, Iowa, U. S. A.

DEALERS IN ALL PRINCIPAL CITIES

PIT AND QUARRY

Vol. 33 AUGUST, 1940 No. 2

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Clipper Model 50	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Shovel No. 2	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes	Yes
Shovel No. 3	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	Yes	No
Shovel No. 4	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes	No
Shovel No. 5	No	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	No	Yes	No	No	No	No	Yes	No
Shovel No. 6	No	Yes	Yes	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes	No
Shovel No. 7	No	Yes	Yes	Yes	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes	No
Shovel No. 8	No	Yes	Yes	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes	No
Shovel No. 9	No	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes	No
Shovel No. 10	No	No	Yes	Yes	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes	No
Shovel No. 11	No	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes	No
Shovel No. 12	No	Yes	Yes	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes	No

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PIT AND QUARRY

CHICAGO AUGUST, 1940

Construction Industry Continues to Show Important Advances

The construction industry continued to forge ahead in June at a high level of activity seemingly unaffected by developments in Europe. Total contracts awarded in the 37 states east of the Rocky Mountains amounted to $324,726,000, representing a 13 per cent. increase over June of last year, according to the F. W. Dodge Corporation. This record gains added significance when it is noted that private contracts rose from $160,721,000 in June 1939 to $177,410,000 in June of this year.

Residential building, which has been particularly strong this year, continued to show an improvement over comparable periods last year by rising from $111,896,000 in June 1939 to $135,274,000 last month. The leading individual class in the residential field continued to be the one-family dwelling built by small home owners with the intention of living in their houses. That this class should bulk so large in the residential total adds stability to the construction industry and optimism to the outlook for a continued high level of work.

Public works and utilities contracts (92 per cent. of which was publicly financed) showed a 17 per cent. increase in June over the corresponding month last year.

Thomas S. Holden, vice president in charge of Statistics and Research of the F. W. Dodge Corporation, said in commenting on the June record: "The high level of building activity recorded for June should dispel all remaining fear that the industry will, at any early date, suffer adversely from the economic displacements caused by the war. There may indeed be decreases in certain classes of construction: for example, public improvements of a civilian character—but such declines are likely to be offset by gains in other categories. Manufacturing building, as one example, is likely to continue at a substantial level, reflecting the advancement of the preparedness program. Moreover, government projects for barracks, other defense buildings, are likely to bulk large in the total for the coming months. Industrial plant expansion will undoubtedly create a large demand for industrial housing."

Illinois to Change Its Road Specifications

According to advice from the Illinois Division of Highways, new specifications for Portland-cement concrete pavement will probably be drawn this fall and will contain two important changes as follows:

1. A provision requiring two sizes of coarse aggregate instead of one size as required by the present specifications. This will necessitate three storage bins—one for each of the sizes of coarse aggregate; the other for the sand.
2. A requirement for surface vibration in the finishing of Portland-cement concrete pavement.

Contractors contemplating the purchase of new equipment should bear these expected changes in mind.

Wisconsin Operator Moves to New Site

The A. Wergin Gravel Company, of Antigo, Wisconsin, has moved its operations to a new site west of the town of Deerbrook due to impending exhaustion of gravel at the old location. A new hopper has been erected at the new site.

Cement Workers Sign New Union Contract

A new contract has been signed by union officials and officers of the Monolith Portland Cement Company plant at Laramie, Wyoming, increasing the wages of 120 employees. The increase averages 4.5 per cent. of former earnings, a union spokesman announced.

Mineral-Wool Industry Attacked by U. S. for Alleged Price-Fixing

Assistant Attorney General Leo F. Tierney has filed action in Federal District Court at Chicago charging eight companies in the mineral-wool industry with restraint of trade in violation of the Sherman and Clayton anti-trust acts.

Defendants named were the Eagle Picher Lead Company and Eagle-Picher Sales Company, of Cincinnati; Johns-Manville Corporation and Johns-Manville Sales Corporation, of New York; General Insulating & Manufacturing Company, of St. Louis; United States Gypsum Company, of Chicago; the Barrett Company, of New York; and Slayter & Company, of Chicago.

The petition charged the Slayter Company with entering into illegal agreements with the other defendants for distribution of certain patents it holds on a process for blowing insulating material into wool. The government asked dissolution of the licensing agreements and denial of the right to fix prices.

Johns-Manville Cited for Misleading Claims

The Johns-Manville Corporation and Johns-Manville Sales Corporation, New York, in the distribution of an insulating material now known as "Rock Cork," have been ordered by the Federal Trade Commission to cease and desist from using the terms "entirely mineral," "mineral composition," "mineral in composition," "mineral—not vegetable," or any other words of similar import to describe a product not in fact entirely mineral in composition.

Commission findings are that the respondent's product was composed of approximately 88 per cent. mineral matter and 12 per cent. vegetable matter, and that the vegetable fiber was not the vegetable matter known and properly designated as cork.

Rules Dredge Workers Are "Seamen" to End Capital Gravel Strike

Two hundred and fifty employees of The Smoot Sand & Gravel Corporation of Washington, D. C., went back to work on July 13 following settlement of a five-day strike, which had halted materials and stalled all major construction projects in Washington, throwing more than 6,500 men out of work.

The major factor in breaking the *impassé*, conciliators agreed, was a concession by Col. Philip B. Fleming, administrator of the Wage and Hour Division, that 60 operators of dredges and other floating equipment should be classified as seamen.

The decision meant that the men were exempt from the Fair Labor Standards Act's 42-hour-a-week restriction and, in effect, reversed the Wage and Hour Division's previous contention that none of them were seamen and that all working more than 42 hours a week must be paid for overtime.

All employees involved received a 10-per cent. wage increase and are to be paid for the time lost during the strike, it was announced after a final conference of company and union representatives.

The walkout, union representatives said, was caused by the "arbitrary attitude" of the Wage and Hour Division and not by disagreement with employer. The union protested reduction of its work week, with proportionate reduction in pay, which the Smoot corporation had arranged to comply with the labor standards law.

The Justice Department, which announced it would investigate charges made by Federal Works Administrator John Carmody that the Smoot corporation has "a practical monopoly" over sand and gravel needed for vital national defense projects, said its plans to present the matter to a grand jury would proceed despite settlement of the strike.

Elsewhere in this issue appears an item wherein Administrator Fleming advised the National Sand & Gravel Association that dredge workers were not "seamen" and therefore not entitled to exemption. The Smoot ruling, made later, reverses this interpretation, but Mr. Fleming has advised Mr. Ahearn that it should not be considered as of general application.

The Newark Plaster Company is planning to rebuild its plant at Clifton, New Jersey, which was destroyed by fire this spring.

RECENT GOVERNMENT CONTRACTS FOR MATERIALS UNDER THE PUBLIC CONTRACTS (WALSH-HEALEY) ACT

Date of Delivery 1940[1]	Supplier	Government Agency	Commodity	Amount
9/30	Morgan Sand & Gravel Co., Inc., Brooklyn, N. Y.	W. P. A.	Crushed stone, gravel	$25,480.00
9/30	Buonielle Builders Supplies Co., Inc., Brooklyn, N. Y.	W. P. A.	Crushed stone	27,950.00
9/30	New York Trap Rock Corp., Haverstraw, N. Y.	W. P. A.	Crushed stone	76,920.00
9/30	Flushing Sand & Stone Co., Inc., Flushing, N. Y.	W. P. A.	Crushed stone	27,060.00
9/30	Road Material Corp., West Brighton, N. Y.	W. P. A.	Crushed stone	63,215.00
9/30	Hudson River Stone Corp., Cold Spring, N. Y.	W. P. A.	Crushed stone	21,120.00
7/1	Colprovia Asphalt Corp., Port Richmond, S. I., N. Y.	W. P. A.	Asphaltic concrete	11,280.00
11/29	Whitehall Cement Mfg. Co., Cementon, Pa.	W. P. A.	Portland cement	32,927.25
6/26	Hill-Thomas Lime & Cement Co., E. St. Louis, Ill.	W. P. A.	Portland cement	12,996.00
6/28	Marquette Cement Mfg. Co., Oglesby, Ill.	W. P. A.	Portland cement	10,120.00
6/28	Universal Atlas Cement Co., Hannibal, Mo.			
6/28	Alpha Portland Cement Co., La Salle, Ill.			
7/5	Anderson Dunham Concrete Co., Baton Rouge, La.	W. P. A.	Concrete pipe	10,734.90
Indef.	Wm. P. McDonald Construction Co., Flushing, N. Y.	W. P. A.	Asphaltic concrete	12,156.75
Indef.	Wabash Portland Cement Co., Osborn, Ohio.	W. P. A.	Portland cement	13,333.80
Indef.	The Standard Slag Co., Youngstown, Ohio.	W. P. A.	Slag	15,849.94
Indef.	The Marble Cliff Quarries Co., Columbus, Ohio	W. P. A.	Limestone	12,840.00
Indef.	Choctaw Culvert & Machinery Co., Columbus, Miss.	W. P. A.	Concrete pipe	15,890.82
6/30/41	Superior Portland Cement, Inc., Seattle, Wash.	Puget Sound Yd.	Portland cement	37,700.00
11/30	Pacific Portland Cement Co., San Francisco, Cal.	War Q.M.C.	Portland cement	10,457.08
Indef.	Vermilion Sand & Supply Co., Maumee, O.	W. P. A.	Sand	15,548.75
12/31	Coplay Cement Mfg. Co., Saylor, Pa.	D. C. Govt.	Portland cement	47,130.00
12/31	The Maryland Slag Co., Sparrows Point, Md.	D. C. Govt.	Slag	49,665.00
12/31	Maloney Concrete Co., Washington, D. C.	D. C. Govt.	Premixed concrete	40,950.00

[1] "Indefinite" refers to indefinite contract; purchases to be made as and when needed.

Pave Airport Runways with Soil-Cement

The Canadian Department of National Defense has announced the award of a contract for the construction of 300,000 square yard of soil-cement runways and taxiways at Borden Field, one of the Dominion's main flying fields and primary training centers. Construction covers several runways 400 feet wide and of varying lengths, and a 100 feet taxiway a mile long.

The contractor, Scott Construction Company, Ltd., is operating 24 hours a day, and expects to complete the job in 30 working days.

Cement Plants Install New Dust-Collectors

The Northern Blower Company reports the recent installation of Norblo dust-collecting equipment in the Alsen, Union Bridge, Fogelsville and Oglesby plants of the Lehigh Portland Cement Company. Installations have also been completed at the Akron, New York plant of the Louisville Cement Company; the Petoskey, Michigan, plant of the Petoskey Portland Cement Company; the Cape Girardeau plant of the Marquette Cement Manufacturing Company; and the Des Moines plant of the Pennsylvania-Dixie Cement Corporation.

The Union Lime Company, of Republic, Washington, is planning to add new lime kilns to its plant, according to reports.

To Quarry Limestone Near Desert Resort

A limestone deposit adjoining the desert resort of Palm Springs, California, is soon to be worked by the newly-organized Crystaline Lime & Ore Company of Banning.

The head of the concern and lessee of the deposit is Z. C. Griffith of Los Angeles.

Seeks Bids on Thirty New Bulk-Cement Cars

The Missouri Pacific Railroad is asking bids from railway-car manufacturers for 30 covered hopper cars for transporting bulk cement.

The cars are to be of the covered type with a capacity of 70 tons each.

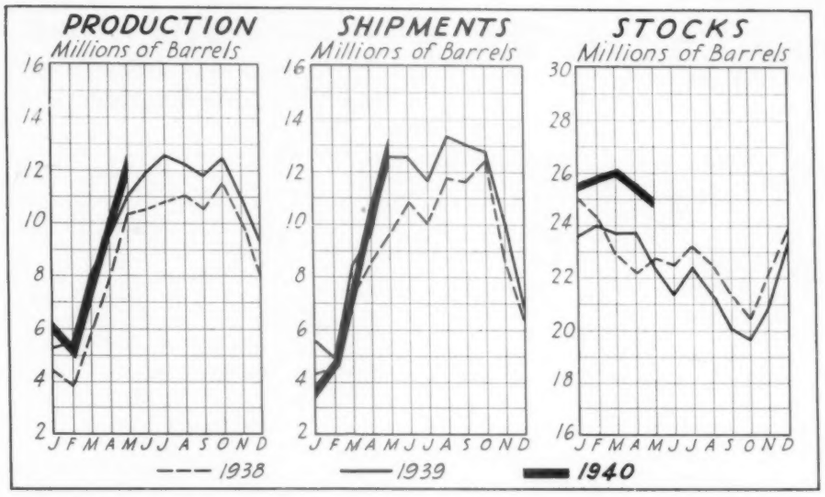
New Florida Firm to Process Lime Rock

The Johnson Stone Company, of New Port Richey, Florida, has begun the development of a lime-rock quarry on a 6,220-acre tract recently purchased.

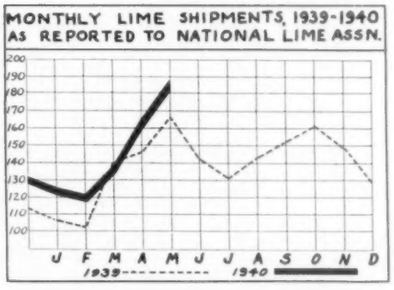
The development will involve an expenditure of over $25,000.

The Canyon Rock Company has been formed in San Diego, California, by V. R. Dennis, and is opening a quarry on the Mission Gorge Road.

The Stolley Sand & Gravel Company, of Spencer, Iowa, has been purchased by John Hymans & Sons, of Hull, Iowa.



The Portland-cement industry in May, 1940, produced 12,668,000 barrels, shipped 13,241,000 barrels from the mills, and had in stock at the end of the month 24,775,000 barrels of cement, according to the Bureau of Mines. Production and shipments in May, 1940, showed increases of 13.3 and 3.9 per cent., respectively, as compared with May, 1939. Portland-cement stocks at mills were 11.3 per cent. higher than a year ago.



According to data collected by the National Lime Association, 72 companies in May, 1940, shipped 187,547 tons (104,427 quicklime; 83,120 hydrate). Reporting companies represent 51.8 per cent. of the association's total capacity of record. Based on PIT AND QUARRY'S estimates for the remainder of the industry the total shipments for the month are estimated to have been approximately 360,000 tons. Shipments of lime by use and grade for May, 1940, were as follows:

Use	Quicklime (tons)	Hydrate (tons)
Agricultural	8,531	25,424
Building	21,035	36,832
Chemical	74,861	20,864
Total	104,427	83,120

Penn-Dixie Seeks to Refund Its 6% Bonds

The Pennsylvania-Dixie Cement Corporation has mailed a letter to stockholders outlining proposals for the refunding of its 6-per cent. bonds. It stated that interest the first year on the new bonds and notes would total $226,875, compared with $397,929 paid on the outstanding bonds last year.

Stockholders will vote on the refunding program at a special meeting to be held August 9. It provides for the issuance of $3,250,000 first 4½-per cent. bonds of 1935 and $2,250,000 or 3¾-per cent. serial notes due in one to five years.

Approval will also be sought for deferring the sinking fund requirements of the preferred stock until the new bank loan and first mortgage bonds and any additional bonds which may be issued under the new mortgage are retired.

Holds Dredge Workers in General Non-Exempt

Workers on dredges are not "seamen" within the meaning of the Fair Labor Standards Act and as such are not entitled to wage-and-hour exemption, in an interpretation delivered by Administrator Philip B. Fleming to V. P. Ahearn, executive secretary of the National Sand & Gravel Association.

The administrator's ruling, dated July 3, was in answer to a request for a decision made three months earlier by Mr. Ahearn.

According to R. C. Kenyon, president, the offices of the Edge Hill Silica Rock Company have been moved from New Brunswick, New Jersey, to the quarry which is located at Fort Washington, Pennsylvania.

EMPLOYMENT AND PAY-ROLLS

(Compiled for PIT AND QUARRY by Isador Lubin, Commissioner of Labor Statistics, U. S. Dept. of Labor.)

Industry	Establishments	Number of Employees	Pay Rolls (1 week)
Cement:			
April, 1940	138	20,674	551,951
May, 1940	138	21,613	600,335
Percentage change		+4.5	+8.8
***Quarrying and non-metallic mining:**			
April, 1940	895	28,604	613,965
May, 1940	895	30,232	692,366
Percentage change		+5.7	+12.8

*Preliminary.

Five Gypsum Makers Indicted by U. S. on Licensing Agreement

A special Federal grand jury has indicted five corporations and nine individuals on charges of fixing the prices of gypsum board, wallboard, and gypsum lath through a patent licensing arrangement.

Indicted were: The United States Gypsum Company, National Gypsum Company, Certain-teed Products Corporation, Ebsary Gypsum Company, Inc., and Newark Plaster Company; and these officers and employes, Oliver M. Knode, William L. Keady, H. Frank Sadler, Sidney F. Bartlett, Ernest A. Gallagher, Melvin H. Baker, Ralph F. Burley, Warren F. Henley, and Arthur R. Black. The men are associated with the five companies.

Artichoke Growers Sue Over Cement-Plant Dust

Thirty-two separate damage suits have been filed by artichoke growers against the Santa Cruz Portland Cement Company who allege that dust from the company's plant at Davenport, California, has ruined their crops. A total of $1,137,000 is sought.

Dust-collecting equipment is now being installed in the plant.

Ohioans Active in Bomb-Shelter Field

Bomb-proof shelters of concrete are reported being manufactured by the Marietta Concrete Corporation of Marietta, Ohio, for a Canadian purchaser.

Stephen Stepanian, vice-president of the Arrow Sand & Gravel Company of Columbus, Ohio, has also been active in this field. He recently designed an all-concrete bomb-proof shelter requiring no forms but of true monolithic construction.

Errata

An item in the July issue reported the leasing of the Lagro, Indiana, plant of Superior Insulations, Inc., to the American Rock Wool Company. The heading was erroneous, however, in stating that the plant had been "purchased" by American Rock Wool. According to W. C. Davis, Superior Insulations, Inc., continues in business and has merely leased its Lagro plant for a year.

An article describing the ready-mixed-concrete operations of the Noonan Construction Company at Pensacola which appeared in the July issue of PIT AND QUARRY should have stated that the four truck-mixers were of Blaw-Knox manufacture instead of Chain Belt. The batching plant serving the mixers is also Blaw-Knox equipment.

Sand, Gravel, Stone Output Rises

The total production of sand and gravel in the United States in 1939 increased 7 per cent. in quantity and 11 per cent. in value, with an output of 194,818,533 short tons valued at $95,224,047 compared with 181,320,233 tons valued at $85,922,847 produced in 1938, according to figures compiled by the Bureau of Mines. Approximately 40 per cent. of the production was accounted for by contractors or highway maintenance crews.

Reported sales by commercial producers amounted to 118,393,120 tons valued at $71,182,558 in 1939 compared with 105,759,786 tons valued at $65,015,878 produced in 1938, an increase of 12 per cent. in quantity and 9 per cent. in value. The average value was 60 cents per ton in 1939 and 61 cents in 1938. Building sand increased 15 per cent. with an output of 26,406,323 tons in 1939 compared with 22,939,683 tons in 1938. Paving sand increased 16 per cent. with an output of 19,468,018 tons in 1939 and 16,755,634 tons in 1938.

Amounting to approximately 88 per cent. of the total commercial production, 103,771,791 tons were reported as washed or screened material with an average value of 64 cents per ton. The average value for unprepared sand and gravel was 31 cents per ton.

Accounting for approximately 90 per cent. of the commercial output, method of transportation was reported for 106,367,071 tons of sand and gravel. Of that amount 45 per cent. was shipped by truck, 40 per cent. by railroad and 15 per cent. by waterway.

With an increase of slightly more than 1 per cent., the sand and gravel output of Government-and-contractor operations (formerly classified as "noncommercial") amounted to 76,425,413 tons in 1939 and 75,560,447 tons in 1938. Average value was 31 cents per ton. Approximately 23 per cent. of the total quantity was washed, screened, or otherwise prepared, with an average value of 51 cents per ton while the average value for unprepared material was 26 cents per ton. Construction and maintenance crews of states, counties, municipalities and other Government agencies produced 36,281,432 tons valued at 25 cents per ton, and contractors working expressly for those agencies produced 36,281,432 tons valued at 39 cents per ton. Output by state highway departments accounted for 47 per cent. of the total production, counties 21 per cent., municipalities 3 per cent., and other agencies 29 per cent.

The total output of crushed and broken stone in the United States in 1939, as reported to the Bureau of Mines by producers, amounted to 145,148,770 short tons valued at $132,908,489, an increase of 18 per cent. in quantity and 13 per cent. in value compared with 1938. Included in this total is stone sold or used for concrete aggregates, railroad ballast, riprap, agricultural limestone, refractory stone, stone for metallurgical use (flux), limestone sand, alkali works, calcium carbide works, sugar and glass factories, paper mills, and various other chemical and manufacturing processes. Stone used in the manufacture of lime or cement, asphaltic stone, and slate used for granules or flour are not included in this total.

Crushed or broken stone used for concrete aggregates and railroad ballast constituted 72 per cent. of the industry in 1939—103,891,020 short tons valued at $93,958,275. Nearly 46 per cent. of the concrete and road making aggregates was produced by noncommercial operators (states, counties, municipalities, and other government agencies). Noncommercial production in 1939 increased 29 per cent. compared with 1938, whereas commercial output declined 1 per cent.

In 1939, 64 per cent. of the commercial aggregates was transported by truck; 22 per cent. by railroad; 9 per cent. by water; and the remainder unspecified. Comparable figures for 1938 are: Truck, 60 per cent.; railroad, 22 per cent.; waterway, 10 per cent.

Crushed stone for metallurgical purposes, which ranks next to concrete aggregates in quantity consumed, increased 78 per cent. in quantity and 82 per cent. in value. Limestone for agricultural use (5,459,260 short tons valued at $6,592,827) increased in both quantity and value. Of the total, 487,500 short tons valued at $513,508 was noncommercial production by the Soil Conservation Service, W.P.A., and other governmental agencies. Refractory stone (ganister, mica schist, dolomite, and soapstone) amounting to 1,492,310 short tons valued at $2,044,054, more than doubled the 1938 production (659,690 short tons valued at $991,765).

Limestone used for miscellaneous purposes increased along all lines with the exception of fertilizer filler and filter beds, which registered small declines. Limestone sand, which is comparatively new, showed an increase of 18 per cent. in quantity in 1939 over the 1938 production.

NCSA Directors Hold Mid-Summer Meeting at Virginia Resort

The annual mid-summer meeting of the board of directors of the National Crushed Stone Association was held July 11, at the Homestead, Hot Springs, Virginia. The meeting was well attended and many of the directors brought their wives. Before and after the sessions, ample time was found to enjoy the excellent golf, riding and other amusement facilities available.

President J. A. Rigg presided over the meeting. The roll call showed the following directors present: Messrs. Boxley, Braun, Callanan, Earnshaw, Graves, Krause, Lane, Rarey, Rigg, Sparks, Tomkins, Wallace, Wills, Worthen. Representing the association were Messrs. Goldbeck and Boyd and Miss Beatrice Gay.

Following the roll call and the reading of the minutes were the reports of A. T. Goldbeck, Engineering Director and J. R. Boyd, Administrative Director. Among the many subjects covered in Mr. Boyd's report were Federal aid and relief acts; seasonal exemption and prevailing minimum wages; jurisdiction of the I. C. C. over private truck drivers; the marketing of agricultural limestone under the A.A.A. grant-of-aid program. Mr. Goldbeck's report covered recent work of his department. Of particular interest was a new process which makes it possible to use wet stone in bituminous mixtures by first coating the wet stone with quicklime and using a small amount of a special fluid in the mix.

Otho M. Graves, on behalf of the executive committee, gave a report on (1) seasonal exemption and (2) prevailing minimum wages.

It was decided to hold the 1941 annual crushed stone convention at the Netherland Plaza Hotel, Cincinnati, Ohio, January 20 to 23, 1941. This date was selected to avoid conflict with the sand-and-gravel convention at Cincinnati January 15 to 17 and the Road Show at New York which opens January 27.

Parashot Kills Quarry Manager by Mistake

David B. Calder, manager of the Fife Redstone Quarry Company in England, was shot dead by a member of the "Parashot" troops on June 30. Mr. Calder, according to British press reports, was driving in his car when a trooper ordered him to halt. Failing to do so, a warning shot was fired and, when he still did not stop, a second shot proved fatal.

New Jersey Quarry Is Enjoined as Nuisance After Protracted Suit

In a protracted suit involving basic points of law on quarry operations in New Jersey, Vice Chancellor Alfred A. Stein issued a sweeping injunction June 21 against operation of the Kernan Quarry on Tillou road, South Orange, in the manner complained of by nearby residents. He reviewed the suit which has been in New Jersey Chancery Court since December, 1938, and held after visit to the scene that the alleged nuisances complained of existed and should be enjoined.

Under the injunction, as made public, the quarry firm is "perpetually restrained" from the following: "Blasting so as to jar, shake or vibrate dwellings of complainants or cause stones to be cast on their premises or cause such noise as will occasion a nuisance; operating rock crusher, steam engines, drills and other machinery with such noise as to cause a nuisance; dropping crushed rock from bins into trucks or dropping rock into hopper with such noise as to cause nuisance; sounding steam whistle; manufacturing and selling 'Kern-O-Mix' or similar products upon the quarry lands."

A provision will allow operating the mixing plant until September 15 to give opportunity to find another location for it. The defendants also will be allowed until September 15 "to make necessary changes or alterations to their crusher, hopper, bins, steam engine and other quarry machinery, rock loading methods and drilling methods to eliminate, if possible, the noises complained of."

When Vice Chancellor Stein granted a preliminary injunction in April, 1939, attorneys for the quarry owners carried it to the New Jersey Court of Errors and Appeals. That tribunal held the injunction was too broad at that stage of the proceedings and remanded the case to Stein who modified it. The June 21 decision sustained many points raised for the complainants by Israel B. Greene, their counsel, who was also a complainant.

Residents testified blasting caused their houses to vibrate, foundations, ceilings and sidewalks to crack and made such noise as to frighten and disturb them.

"Noise and offensive odors," the court stated, "even when not injurious to health, may constitute a nuisance if they render the lives of complainants uncomfortable."

The quarry concern had a municipal permit from South Orange to use explosives. This permit, the court held, "does not justify the use thereof in such manner as to constitute a nuisance. It is beyond the power of a municipality to authorize the maintenance of a nuisance."

"Although defendants have an undoubted right to quarry stone on their property," the court added, "the complainants enjoy the right to the undisturbed use and possesson of their houses. If those rights conflict, the right of defendants to operate the quarry must yield to the latter, which, in the eyes of the law, is the more important of the two.

"A nuisance may be merely a right thing in a wrong place.

"Carrying on an offensive trade for 20 years, in a place remote from buildings and public roads, does not entitle the owner to continue in the same place after houses have been built and roads laid out in the neighborhood, to the occupants of and travelers upon which it is a nuisance."

Pacific Coast Concern Broadening Its Line

A broader line of building-supplies has been taken on by Pacific Coast Aggregates of San Francisco and its retail-sales organization considerably enlarged, according to A. K. Humphries, president.

Donald Meek, general sales-manager, is directing the expanded program.

Railroad Shipments of All Materials to Rise in Third Quarter

An increase of 6.7 per cent. in freight-car loadings of gravel, sand and stone during the third quarter of the current year above the corresponding 1939 period is forecast by estimates of the 13 Shippers' Advisory Boards throughout the country.

Car-loadings of gravel, sand and stone are expected to reach a total of 382,568 during the current year third quarter, as against 358,476 in the same period last year, according to the estimates.

An increase of 5.6 per cent. in car-loadings of cement also was forecast for the quarter, the total increasing from 171,420 to 181,073. Car-loadings of brick and clay products are expected to jump 7.2 per cent., from 58,596 to 62,830, while lime and plaster car loadings are expected to increase 9.7 per cent., from 39,270 to 43,080.

Lehigh Adds Storage Silos at Iola Plant

Twenty storage silos with a combined capacity of 100,000 barrels of cement are under construction at the Iola, Kansas, plant of the Lehigh Portland Cement Company.

Efficiency of Rotary Lime Kilns

By THERON C. TAYLER

The keen competition of the depression years has made us all conscious of the advantages of better-quality products. Quality in all lines is "on the up and up." Lime producers are meeting the demands as presented by the specifications of consumers. Some producers derive increased earnings as a result of their activities in promoting higher quality; a few trail along until declining orders force them to make improvements.

Some new kilns are being installed and there is a growing tendency to seek added output from existing kilns as expanding markets develop.

It is still common practice to burn fuel at 2,500 degrees F. and let the gases pass up the stack at 1,250 degrees, thus wasting 50 per cent. of the heat of the fuel. An additional 25 per cent. is wasted in radiation from the shell, in sensible heat of lime discharged from the kiln, in poor combustion, etc. An increasing number of plants are becoming interested in reducing these losses. Before making any prediction of things to happen in the field of rotary lime-kiln efficiencies, I am going to recall what has happened under less favorable conditions.

Twenty-five years ago engineers designed boiler plants on a basis of 5 pounds of coal per boiler horsepower. This corresponds to a thermal efficiency of 45 per cent. To-day boilers are operating at efficiencies of 85 to 90 per cent. Expressed in another way, we are getting double the boiler output, while burning no more fuel than we did twenty-five years ago.

As we approach 100 per cent. efficiency it becomes increasingly difficult to effect material improvement. To improve the efficiency of a kiln producing 3 pounds of lime per pound of coal —about 25 per cent. efficiency—is easy; we merely have to copy what has been done in another plant to produce double the output with no added fuel.

To-day there is much satisfaction in a record of 5 pounds of lime produced per pound of coal. Why, that is not even 50 per cent. efficiency! It is little better than the boiler plant of twenty-five years ago. We are just beginning to climb the ladder of successful lime-plant design.

In the next installment we shall explore the possibility of rapid advance in rotary kiln efficiencies and capacities.

CURRENT BUSINESS INDICATORS

Not since the N.R.A. has this nation witnessed the wide public interest in any government activity that has been accorded the Advisory Commission to the Council of National Defense. Significant, perhaps, is the fact that no alphabetical abbreviation has been derived from the somewhat cumbersome name, although it is commonly shortened to Defense Commission or National Defense.

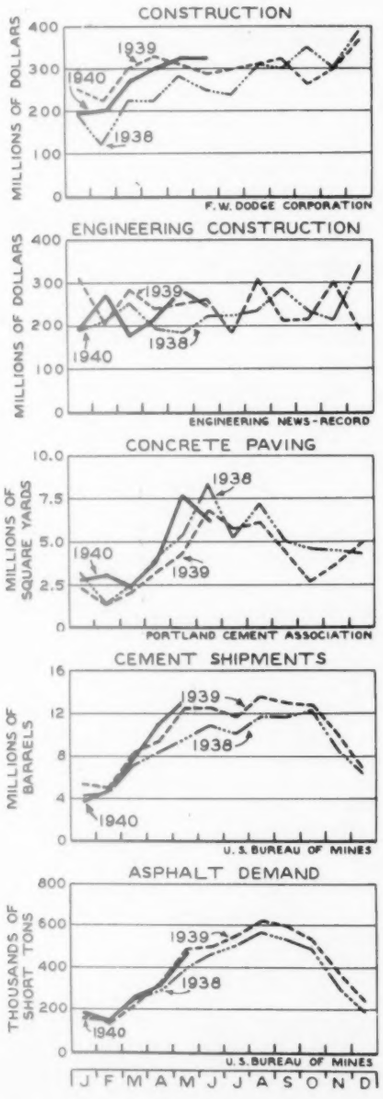
The defense group has worked swiftly and soundly, calling upon existing agencies for personnel as well as data and counsel. Rumors as to the number of new jobs to be created in the defense organization, including expansion of civilian personnel in the Army and Navy, range as high as 30,000, but, if the Defense Commission continues to take advantage of the facilities of existing agencies, little duplication of activities is to be expected. Most of the available jobs require civil-service status and a shortage in certain classifications is seen.

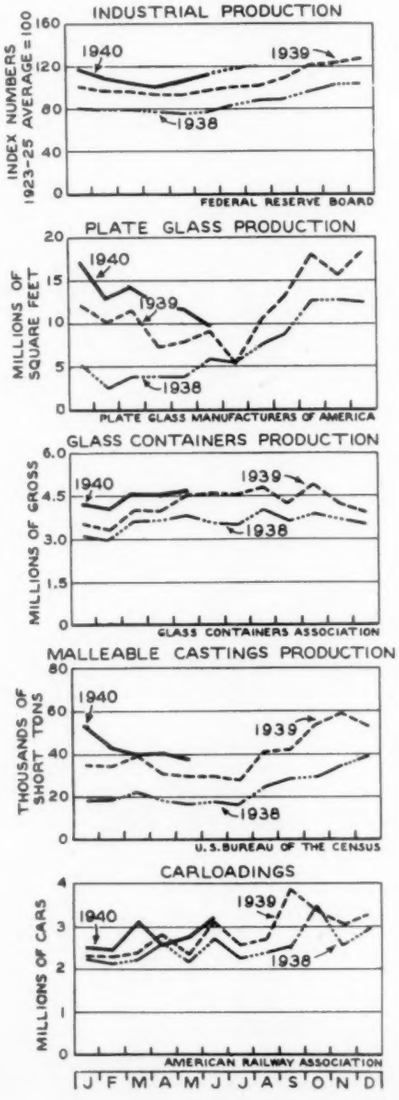
Substantial quantities of strategic and critical raw materials are being acquired, according to the first overall report of the Defense Commission released by the President July 16. In some instances actual purchases have been negotiated and the material loaded aboard ship within a period of three or four days after the availability of the product was made known. In coöperation with specialists in government and industry, careful surveys of all strategic and critical materials have been made. Of particular interest is the announcement that in an emergency most of our rubber requirements can be supplied through the manufacture of synthetic substitutes. Industry is coöperating in the development of tin-smelting facilities to relieve our dependence on foreign smelters. Large quantities of 100-octane aviation gasoline are to be stored underground at strategic locations.

Between June 6 and July 16 actual contracts in the amount of $1,661,981,494 were let; $1,390,575,405 for the Army and $271,316,089 for the Navy. Material covered under these contracts includes airplanes, tanks, battleships, ammunition, anti-tank guns, anti-aircraft searchlights, machine guns, various fire-control precision instruments, tractors, trucks, blankets, overcoating, serge cloth, worsted shirting, service shoes, ship-propulsion machinery, storage batteries for submarines, airport and airstation construction, barracks, and many other items necessary in equipping the United States Army and Navy. Relatively little of this money has gone into construction materials but necessary industry expansion will certainly benefit the building-materials industries. Air bases and other defenses likewise will provide outlets for cement, aggregates, and other materials.

A plan for training skilled workers is included in the defense program but thus far the needs of private industry for skilled and other labor are being met. The domestic price structure is under constant surveillance, and protection of the public from unjustifiable increases in prices of consumers' goods is a major project. The complicated problems involved in amortization for income-tax purposes, as well as those inherent in the government policy for lending through the R.F.C. to expedite plant expansion, have received special consideration. Farm and transportation problems also attract attention.

Meanwhile the volume of industrial production in the United States increased rapidly during June and rose even further in the first half of July. The Federal Reserve Board's seasonally-adjusted index advanced from 106 in May to 114 in June and will probably be somewhat higher in July. The greatest increases in output occurred in the steel and textile industries. Steel plants were operating at 86.8 per cent. of their capacity for the week ended July 20, continuing the high level of the previous month. With the largest volume of steel orders from the defense program yet to come, steel and other durable-goods industries are getting prepared for busy months.





EDITORIAL

Intellectual Isolationists

MOST human minds, suddenly presented with ideas previously unknown and, therefore, believed to be new, are so appalled by the supposed novelty of them and the threats to their self-interest which their common acceptance implies, that they are unable to view them rationally or to make any reasonable appraisal of their ultimate worth. The disturbance of their settled convictions which results from even a casual consideration of them prevents logical analysis.

The so-called "new deal," which roused first men's fear and then their antagonism, was new only in the sense that it embraced ideas which, although old, had never been heard of by most of the business men who felt the pressure that they exerted. Minimum wages, maximum hours, the prohibition of child labor, ideas which had formed a large part of the thinking of thoughtful people for years, struck with the suddenness of lightning the complacent minds of the great majority of Americans. The thoughts of regulating banks, insurance companies and investment brokers in the public interest, of organizing workers in industrial rather than craft unions, of sustaining the employable unemployed at public expense, hit most of us with cataclysmic suddenness. Unaccustomed as most of us were to thinking of political and economic proposals in the light of the public good, instead of personal advantage, we viewed every suggested change with fear and resentment.

The pressure of competition in the struggle for existence so completely engrosses the attention of most people that they have little time, and even less desire, to keep abreast of current thought. In our attitude toward social and economic problems we Americans were at least fifty years behind the actual accomplishments of industrial Europe. Even business men, who might be expected to be more alert to the signs of progress—if for no other reason than that they stand to lose most in a material sense through the adoption of "new" economic ideas—show no more interest, on the whole, in "coming" developments than the most self-satisfied, comfortable and unimaginative members of our middle class. Worn to exasperation by the petty problems of each day's living, they too seek amusement and relaxation in their reading and carefully avoid contact with ideas which compel thoughtful consideration or disturb their settled beliefs. The newspapers, their chief, and often only, source of information (as well as misinformation) have no interest in thought itself until it develops into action worthy of "news" treatment.

Take World War II as an example. Of nearly two hundred business men, whom we have questioned about their reading habits in recent months, the great majority read nothing but their daily newspapers. A small number read weekly news summaries; a very small minority occasionally read a book. Not one had read Hitler's *Mein Kampf,* Roberts' *The House That Hitler Built,* or Rauschning's *The Revolution of Nihilism,* to mention just a few of the really important books that have appeared in recent years and deal with the political theories and ambitions of National Socialism. The overwhelming majority of these men are what might be called "intellectual isolationists" or "intellectual noninterventionists"; they were opposed to "meddling in other people's ideas."

Almost without exception these men were horrified by the happenings of the last few years; the seizure of Austria and Czechoslovakia and the conquest of Poland, Denmark, Norway, Luxembourg, Holland, Belgium and France had aroused successive cries of moral indignation. Although the fate of each had been amply predicted by that of its predecessor, each new collapse was received with all the astonishment that ordinarily greets an unprecedented event. Yet, except for the details, and for the order in which these countries succumbed, the entire program was expected by everyone who had read any of the three works mentioned, to say nothing of the dozens of other books in foreign languages which have dealt with the same questions. Without the background of informed judgment which a study of such writings provided, it was impossible for easy-going, peace-loving, friendly Americans to believe that there could exist outside the walls of a mental institution such brutal disregard of human rights, such distortion of truth, such overwhelming ambition and conceit.

For the readers of such authoritative discussions there could be no doubt as to the ultimate objectives of the present drive for *Lebensraum*. "A new peace shall make Germany 'mistress of the globe'," the Russian-born Alfred Rosenberg had said. There is, wrote Hausofer, a "natural right to room to live" which can be enforced "against owners of great spaces who have not the capacity to develop their reserves of space." Eleven years ago Hitler said, according to Rauschning, former president of the Danzig Senate, "that the Germans could not accept the existing order in the West, and France must be ruthlessly destroyed in a 'final decisive struggle'." And, writes Rauschning, "America is already [May, 1939] at the outset of internal convulsions produced by a war of ideologies. Here, too, a change may easily come, incredible as it seems as yet, which will convert American opposition into willing discipleship. In the National Socialist view the political situation in America is unstable and can be developed into an outright revolution; to do this is both a tactical aim of National Socialism, in order to hold America aloof from Europe, and a political one, in order to bring both North and South America into the new order. By its ubiquity and its tactics of universal menace, National Socialism is preparing to occupy the key positions for colonial domination, for domination of the great sea routes, and for the domination of America and the Pacific."

Americans, though possessed of the majority of the world's radios, newspapers, magazines, books and motion-picture theaters, are nevertheless the worst informed of the world's civilized peoples in matters on international concern. Their isolation in politics is the natural result of their isolation in thought. In politics, as in other fields of human activity, we have been warned by competent students of world movements. If we are too self-centered to profit by the opportunity, we must expect to pay the penalty involved in being taken by surprise.

By W. E. TRAUFFER

Specialized Plants Supply Aggregate Needs of Santee-Cooper Dam Project

THE many large power and navigation dams built within the last decade in all parts of the country have had an important effect on the specifications covering aggregates and on the methods of producing those materials. For this reason most of the more important projects have been visited by the writer and articles describing the aggregate-production methods have been published in PIT AND QUARRY. Included in these projects were Boulder Dam, Coulee Dam, Bonneville Dam, Colorado River Aqueduct, Fort Peck Dam, Norris Dam, Wheeler Dam, Pickwick Landing Dam and others. On some of these jobs aggregates were produced by the contractors, on others by the governmental authority and in still others by commercial producers. All these producing plants had features which justified their description.

The Santee-Cooper Power & Navigation Project now under construction near Charleston, South Carolina, is no exception to the rule. Estimates showed that the aggregate requirements for this project would total about 158,000 tons of sand and 353,000 tons of gravel. Investigation showed that relatively few sources of aggregates of good quality were available within economical shipping distance and, it is said, that few producers capable of providing that amount of material in the allotted time were located within reach. Because no large gravel was available in this area, the Richmond Sand & Gravel Company of Richmond, Virginia, was awarded a contract for enough 2½- to 6-inch cobbles for about 110,000 cubic yards of concrete. These are shipped by railway a distance of about 360 miles.

Drag-line loading a truck under difficult operating conditions.

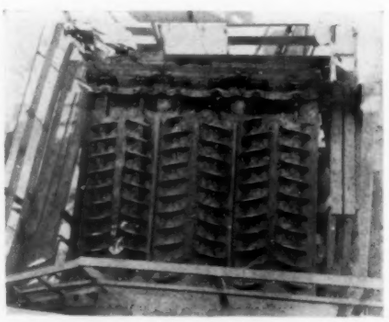
Swinging belt-conveyor which stock-piles dewatered sand at Bonneau plant.

The Becker County Sand & Gravel Company of Detroit Lakes, Minnesota, was awarded the sand-and-gravel contract amounting to over 350,000 cubic yards. This company is primarily a commercial producer with permanent plants at Detroit Lakes. This company, in co-operation with the J. L. Shiely Company, St. Paul, Minnesota, formed the Becker County-Shiely Company, which produced all the aggregates for Fort Peck Dam. This experience is standing the company in good stead on the present project. Some of the equipment being used was brought down from the Fort Peck plant. E. A. Mullen, vice-president of the company, who is in charge of all production here, was active at Fort Peck.

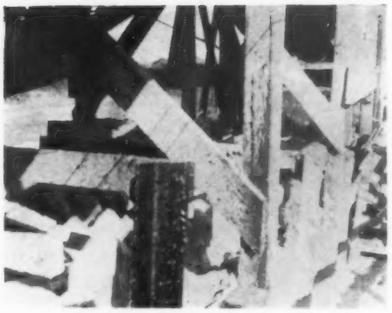
A brief description of the history back of the Santee-Cooper project should be of interest. The Santee River drains a large part of the state, including some of its most important industrial sections, among them Columbia, the state's capital and largest city. The Cooper River is much smaller and less important, but it empties into the Atlantic Ocean at Charleston, one of the best harbors in the South. A fall of 45 feet between the Cooper and Santee Rivers suggested the advisability of a combined power and navigation development.

Development of the navigation phase dates back to 1771, when a waterway was mapped to connect the two rivers. Work commenced in 1793 and the canal was completed in 1800. Later the advent of railroads forced the abandonment of this canal. In 1915 the hydroëlectric possibilities were investigated and found capable of practical exploitation, but nothing was accomplished until 1933, when a movement to build and operate the project under public control was begun. In 1934 the South Carolina Public Service Authority was created to direct construction and operations. After investigation by the Federal Power Commission, Public Works Administration and U. S. Army engineers, Federal funds were allotted and the program was begun.

When it will have been finished in 1941, the development will consist of two reservoirs or lakes, the Santee and the Pinopolis, covering respectively 155 and 95 square miles. The Santee Dam will be 8 miles long with a 3,400-foot concrete spillway requiring 128,100 cubic yards of concrete. The Pinopolis



The six screws which wash and dewater the sand at Bonneau plant.



Log-washer and vibrating screen.

Dam will be about 2 miles long. Both are to be primarily of earth construction. The two lakes will be connected by a diversion canal nearly 8 miles long. The Pinopolis Dam will include a lock and a powerhouse, which will have an initial installed capacity of 173,000 horsepower. This job will require 196,000 cubic yards of concrete.

The Harza Engineering Company is employed as designing engineer to prepare plans and specifications and to have general supervision over the engineering construction of the project. The contract for building the Pinopolis

One of the 8-cubic yard tractor-trailers discharging at the gravel plant.

west dam, power-house sub-structure and lock was awarded to the Central Engineering Company. Excavation and the building of the earth dam was sublet to several other contractors. The McCarthy Improvement Company has the contract for the concrete spillway on the Santee Dam. Several other contractors are doing the earth work.

The sand-and-gravel company has separate contracts with the two companies last named. The contract with the Central Engineering Company calls for 200,000 tons of gravel and 120,000 tons of sand; that with the McCarthy Improvement Company calls for 140,000 tons of gravel and 75,000 tons of sand. Deliveries to the former company for the Pinopolis Dam began November 15, 1939 and those to the latter company for the Santee Spillway began in May of this year.

The Becker County Sand & Gravel Company was faced with some rather unusual problems in deciding how to supply the materials to fill its contract. The main gravel deposit is near Lugoff, 7½ miles southwest of Camden and 95 miles by railway from the Pinopolis Dam. The sand in this deposit amounted to about 50 per cent. of the total material but, because of the high freight rate, it was decided that sand could be more economically produced from a deposit nearer the dam. This deposit is at Gravel Hill, 3 miles east of Bonneau and 9 miles from the dam. This sand is deficient in several of the fine fractions. To make up for this a deposit of fine sand 3 miles west of Bonneau is worked. This sand is clean and is loaded by a Byers ¾-cubic yard crane into trucks which haul it to the dam site. This material forms about 5 per cent. of the total aggregate used in the concrete. The sand plant produces about 100 tons of sand and 25 tons of ¾-inch gravel per hour. The gravel plant produces 30 carloads, or about 1,650 tons, of gravel in 11 hours, an average of about 150 tons per hour. As the percentage of 1½- to 3-inch gravel is a little below the requirements a few cars of this size are supplied daily by a local commercial producer.

The aggregate specifications for this work are similar to those used by the Bureau of Reclamation on its projects. Coarse aggregates are specified in three sizes: ¾-inch and under with a maximum of 15 per cent. passing through a ¼-inch mesh; ¾- to 1½-inch with 15 per cent. maximum passing through ¾-inch mesh; 1½- to 2½-inch with 25 per cent. maximum passing through a 1½-inch mesh. The last-mentioned tolerance was permitted to conform as closely as possible to highway-department specifications.

The processed coarse sand and the unprocessed fine sand are inspected at the mixer by the Parker Laboratory of Charleston, which is retained by the contractor to oversee production, thereby eliminating car sampling and placing on the contractor all the responsibility for breakage and segregation. The blending is done at the central-mixing plant.

The deposit at Gravel Hill has from 1 to 4 feet of overburden and is from

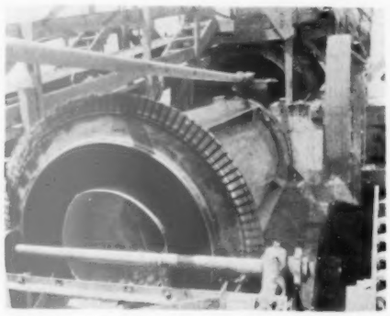
Two vibrating screens which separate the washed and scrubbed gravel.

12 to 30 feet deep. It contains about 65 per cent. sand, 25 per cent. gravel under ¾-inch in size, and 10 per cent. clay. It rests on a bed of thick blue clay. A Northwest drag-line, with a 1¾-cubic yard Page bucket and a Twin City gasoline engine, loads this material into a fleet of four Ford V-8 trucks, each hauling a 4-cubic yard load.

The material is discharged through a grizzly into a hopper, from which a

Two of the tractor-trailers being loaded by drag-line. Plant in background.

Diamond pan-feeder deposits it on the 24-inch by 279-foot main belt-conveyor. From this conveyor it is discharged into a wash box, where a 3-inch jet of water is introduced. Next in the flow is a Link-Belt Type PD heavy-duty 2-deck vibrating screen. A ¾-inch opening is used on the top deck to remove clay lumps. Sand passing through the 3/16-inch bottom deck goes to a set of six 20-inch diameter by 18-foot Eagle sand-screws for final washing and dewatering. The feed to this washer is unique in that 1,600 gallons of water per minute is fed into it along with the sand. In order to retain the minus 50- and 100-mesh material it was necessary to reduce the velocity of the water coming from the screen. This was done by means of a launder with slotted openings between the screen and the screw-dewaterer. The lower end and sides of the washer were built extra high in order to provide the extra settling necessary. The finished sand is stock-piled by a 24-inch by 50-foot swinging-boom conveyor.



The 6- by 20-foot scrubber which removes clay from gravel. Revolving scrubber screen in background.

The material retained on the bottom deck of the screen goes to a 36-inch by 20-foot 2-shaft Eagle log-washer which breaks up the clay. Next is another 2-deck Link-Belt vibrating screen with 1½-inch openings on the top deck and 9/64 by ½-inch slots on the bottom deck. Material retained on the top deck of this screen is wasted. The fine material passing through the bottom deck goes to the screw-dewaterers; that retained on the bottom deck goes into a 60-ton wooden bin as ¼-inch gravel. This latter material is stock-piled by trucks and is later rerun through the plant to insure the removal of all the clay.

Stock-piled aggregates are loaded by a Byers ¾-cubic yard gasoline crane either into a truck-loading hopper or direct into trucks for haulage to the job. Ford trucks with Fruehauf 8⅓-cubic yard trailers are used for this purpose.

Internal-combustion engines operate all the plant's equipment. The main conveyor, feeder and the first screen are driven by a 65-horsepower Allis-Chalmers semi-Diesel engine. The log-washer and second screen are driven by a 120-horsepower Waukesha gasoline engine and the screws by another Allis-Chalmers 65-horsepower semi-Diesel engine. The swinging sand-stockpiling conveyor is driven by a 15-horsepower Allis-Chalmers gasoline engine and is swung by hand. Water is supplied from a swamp at the rate of 850 gallons per minute through 1,500 feet of 12-inch line by a 6-inch Fairbanks-Morse centrifugal pump driven by a 75-horsepower Waukesha gasoline engine. Both screens in this plant are equipped with Twin City wire cloth. Most of the equipment is driven through Gates V-belts.

The deposit at the gravel plant is typical of others in this area. Evidently an old river-bed deposit, the gravel is very hard and flint-like but is coated with clay. There are only a few bowlders and about 5 per cent. of the gravel is over 2½ inches in size. Sand amounts to about 50 per cent. of the material. Usable material exists to a depth of 12 to 14 feet. The overburden averages 4 to 5 feet in thickness and is removed.

A Lima 801 drag-line, with a Page 2½-cubic yard bucket and a Waukesha Hesselman Diesel engine, loads the material into a fleet of three 8-cubic yard Euclid Trac-Truks. These have short-wheelbase tractors and bottom-dump 2-wheel trailers and are powered by Waukesha gasoline engines. Firestone 20-ply tires are used. A fourth unit is kept in reserve. At the time the writer visited this plant the workings

Discharge points of the sand drag. One of the two 8-foot sand tanks at the right.

were 1,000 feet from the plant and the three units were handling 300 tons of material per hour, keeping the plant operating at capacity.

The material is discharged over an 8-inch rail grizzly into a 35-ton hopper. A reciprocating-plate feeder serves the 36-inch by 325-foot main Link-Belt belt-conveyor. The material is discharged at the top of the plant into a wash box where it soaks before going on. Next in the flow is a 5-foot by 16-foot revolving screen with 8 feet of scrubber section followed by 8 feet of ¾-inch wire screen. There is also a ¼-inch outer sand jacket.

The sand goes into two Telsmith 8-foot sand-cones followed by a Link-Belt sand-drag. The finished sand can be discharged into a bin or into stock-piles. This sand forms a reserve supply for the project in case of necessity and some of it is expected to be sold commercially.

The gravel retained on both jackets of this screen goes into a Lippman 6- by 20-foot revolving scrubber or blade-mill. The product is discharged on a 4- by 10-foot Link-Belt 3-deck vibrating screen equipped with 2½-, 1½- and ⅛- by ½-inch wire cloth. The oversize material is chuted to a 9- by 36-inch Wheeling jaw crusher, the product of which goes on a 20-inch by 55-foot belt back to the main belt. The material retained on the second deck goes on a 20-inch by 40-foot belt-conveyor into a bin.

Material retained on the bottom deck of this screen goes to a 4-by 12-foot Robins Gyrex 3-deck screen with ¾-, ⅜-, and ⅛- by ½-inch cloth. The material retained on the top deck goes to one bin while the materials retained on the other two decks are combined and are sent to another bin. Material through both screens goes to the sand cones.

There are four 150-ton wooden bins, three for gravel and one for sand. Cars are loaded on a 26-car siding which connects with the Seaboard Airline Railway one mile away. Material is also stock-piled and reloaded to cars by a Northwest crane. Switching is done by a Caterpillar RD7 tractor which is equipped with a Le Tourneau bulldozer. This is also used for stripping overburden, maintaining road, etc. Wash-water for this plant is secured from a 1-mile ditch connecting to a creek. A 8-inch Fairbanks Morse pump and a 12-inch line are used. Twin City wire cloth is used on the screens and Gates V-belts on most of the drives.

National Gypsum Shows Slight Drop in Net

The National Gypsum Company reported net profit for the first six months of 1940 amounted to $607,636, equal to 37 cents a share on the common stock, compared with profit of $696,705, or 44 cents a share in the first half of 1939.

Melvin H. Baker, president, reported that the new board mill at New York was put into production in May and is already turning out high quality products in large volume.

New A.S.T.M. Cement Specifications to Become Effective September 2

TWO full sessions of the forty-third annual meeting of the American Society for Testing Materials, held in Atlantic City, June 24 to 28, were devoted to the subjects of concrete and other cementitious materials.

Of unusual significance was the annual report of Committee C-1 on Cement recommending new specifications for portland cement comprising five types, including one for use in general construction, another for high-early-strength, one for use when a low heat of hydration is required and one for use when high sulphate resistance is required, and type II for use when special properties of the three latter types are not required. For all five types the autoclave expansion is set at 0.50 per cent. max. A new method of test for autoclave expansion was accepted as tentative. Thus, after a great deal of discussion and debate the Society will publish this testing procedure.

One important provision was made, namely, that the new Portland cement specifications will not become effective until September 2, 1940. Ultimately they will replace the present Standard Specifications for Portland Cement (C 9-38) and for High-Early-Strength Portland Cement (C 74-39). An important part of the report included details of an investigation of mortars by seven laboratories, the committee in charge concluding that none of the plastic mortars covered in the investigation showed sufficient superiority over the C 109 mortar to warrant a change in type of mortar and it recommended that the Tentative Method of Test for Compressive Strength of Portland Cement Mortars (C 190—37 T) be retained. There was included an extensive discussion of comprehensive work on studies of various types of soundness tests.

F. O. Anderegg presented a paper on *Some Properties of Mortar in Masonry* which included a description of a method for estimating the extent of bond using a dye solution and also a procedure for cutting specimens from brick joints to obtain crushing strengths of the mortar. Four methods have been used for durability determination: artificial freezing and thawing, natural freezing and artificial thawing, exposure in a pan on the roof and a modified sodium sulphate test. The last is too severe, but the others gave similar results. The second is apparently most rapid.

The results of a very comprehensive research on sulphate resistance of 106 commercial cements were described by Dalton G. Miller and Philip W. Manson.

A paper *A Method of Measuring Thermal Diffusivity and Conductivity of Stone and Concrete* was described by W. T. Thomson of Kansas State College. Thermal stresses play an important part in concrete deterioration—consequently these properties are significant.

In a paper by H. E. Davis dealing with *Autogenous Volume Changes of Concrete* presented in abstract by M. O. Swayze, tests over a period of five years indicated that under certain conditions the autogenous shrinkage may be of the order of 50 to 100 millionths. This phenomenon is due primarily to volume changes of cement paste as a result of hydration of the cement. Such values are of sufficient magnitude to require consideration in the interpretation of the results of strainmeter observations made in large masses of concrete over a considerable period.

W. R. Lorman covered *The Theory of Concrete Creep* in his paper. His explanation is based on the gel theory. While he indicated that the existing data were as yet too incomplete to allow a more precise indication of the actual relations existing between the creep constants and the various physical factors, creep strain is proportional to stress accurately for stresses from 0 to 650 p.s.i. and approximately for stresses from 650 to 1500 p.s.i. Various dimensional factors need to be considered. Creep co-efficient of concrete made with low-heat cement is about one-third greater than that of normal cement concrete.

Featuring the second session devoted to the subject of concrete was the First Sanford E. Thompson Award presented to T. F. Willis and M. E. De Reus, Missouri State Highway Department for their paper on *Thermal Volume Change and Elasticity of Aggregates and Their Effect on Concrete*. This award, established by Committee C-9 on Concrete and Concrete Aggregates, is an annual token of recognition to the author or authors of a paper of outstanding merit on concrete or concrete aggregates presented at an annual meeting of the Society. The award is named in honor of the first chairman of the committee. Mr. Thompson was in attendance and presented the recipients to the chairman of Committee C-9, Mr. F. H. Jackson, Public Roads Administration, who made the awards, including the two certificates and a check for $50.

In the C-9 Report were two proposed methods of tests, one for efficiency of materials for curing concrete, and the other intended to provide a standardized procedure for determining the volume changes of cement mortar and concrete when a fairly simple, routine test is desired. These were approved by the Society session.

Four technical papers in this session were of considerable interest. One on *Designing Concrete Mixtures for Pavements* by W. F. Kellermann (presented by Mr. Jackson) and another on *Measuring Changes in Physical Properties of Concrete by the Dynamic Method* by W. T. Thomson, were extensively discussed. Mr. Kellermann's paper covered a method of investigating flexural strength in connection with the problem of designing concrete mixtures for pavements. Also given were the results of laboratory tests which demonstrate how flexural strength may vary over a wide range due to aggregate characteristics. Twenty-five aggregate combinations were involved in the mixtures with a wide range varying from extremely fine to extremely coarse.

In order to determine the cement content required to produce a flexural strength of 550 p.s.i., the results of the tests were plotted so as to show the relation between cement factor and flexural strength for each combination of materials. From these curves the cement factor required to develop the specified strength was found to vary from 4.9 to 7.1 sacks per cubic yard. This variation of approximately 2 sacks per cubic yard was due to characteristics of the aggregates only, as one lot of cement was used throughout.

Compressive strength data did not reveal the wide difference in the concrete making properties of the aggregates as was shown by the flexure tests, indicating the desirability of examining the materials to be used along the lines indicated when designing concrete mixtures for pavements.

In a slide used by Mr. Jackson, but not reproduced in the paper, the effectiveness of the fineness modulus in design was demonstrated. The use of this modulus was commented on by a number of men present, with the probable general consensus that even though a considerable amount of computing and statistical work may be involved,

(Continued on page 47)

OBSOLESCENCE IN THE LIME INDUSTRY

By "CALX"

THE lime industry is rich in properties that do not make money. In fact, a lime plant operating on a profitable basis is the exception rather than the rule. Serving the chemical, agricultural aud building-industries with a wide variety of unstandardized products and under a variety of specifications, the lime business is complex. The numerous underlying causes of this condition are not particularly difficult to understand. The difficulty lies however in convincing the industry—which after all is composed of Americans with their characteristic dislike for facts of an unpleasant nature—that it is probably "so close to the trees that it can not see the forest."

There are few industrial arts which are supported by a background of experience such as belongs to the lime industry. We know that the Greeks and Assyrians, as well as the Egyptians, were skilled in the making of vessels, boxes and sculptural effects from hydraulic "limes" 5,000 years B. C. Archaeologists have excavated two-coat pure-lime plaster with hair as a backing used for mural painting in the Palace of Ruossos in Crete dated 1,500 B. C. Pliny, in describing the great care exercised by the Greeks in the mixing of their stucco, mentions the Temple of Elis. We get the first mention of lime as a reagent in 350 B. C. from Xenophon, who records that ships carrying a cargo of linen and lime for its bleaching were wrecked near Marseilles. Cato, who lived to the ripe old age of 115 years (234 to 149 B. C.), in the *De Re Rustica,* a treatise on good husbandry, considers the subject of lime. Dioscordides in 75 A. D. describes the slaking of lime and its medicinal value in the form of lime water.

King John of England in 1212 A. D. knew of the sanitary and fireproofiing qualities of lime. Trevisa in 1398, describing the properties of lime said, "Whyle Lyme is cold in handlying, it conteneth prevely wythiss fyre and grete hete." Decorative plaster in the hands of Raphael, Sigorio and Michelangelo reached a high state of development during the Renaissance. The discovery of limestone at Newbury, Massachusetts in 1697 marks the beginning in this country of the industry as we know it today. Yet, despite all this in progressiveness and efficiency we rate very far down in the modern scheme of things.

These days we read much concerning "decadence," generally referring to European cultures, nations, armies, etc. As we read we invariably associate the term with some one or something apart from ourselves. Yet no more fitting phrase can be applied to the lime industry in general than "decadent." With a heritage almost as old as time itself, yet in its prime, it is a business recognized as unprofitable.

What is the answer? What does the industry need?

1. Courage and research.

2. A strong national association, and research.

3. Much new blood, and research.

4. Intelligent, hard work, and research.

5. Plant obsolescence, and more research.

(1) Those in charge of many of the important lime companies have been there too long. They have had their opportunity to land their security holders on the profit side of the ledger, but in many cases they have failed to do so, because they have not had the courage to keep abreast of advancing times by convincing their directors and principals of the vital importance of a strong research effort.

(2) The industry abounds in those men, who, after years of trial and error, have not learned the relation between cut prices and increased volume. A strong price policy, with a predetermined cut-out per ton for research, plus confidence in, and energetic support of, a national trade group is step number two in the direction of a "come-back."

(3) These young fellows are smart and well do the large progressive firms know it. This year's graduating classes of chemical engineers had been combed over well before commencement time. The industrial leaders of the nations think so much of these boys that they offer them from $1,250 to $2,400 per year to serve apprenticeships. Out of this group the backbone of progressive industrial enterprise is to be molded. As you travel by air, note the type of personnel which mans the air-travel organization; then compare the intelligence, courtesy and energy you find, with the type of man back home in your lime plant. The awakening may be quite a shock but for tomorrow's profit the lime producer had better call in and utilize the intelligent trained enthusiasm of youth. It will help him with his research problems too.

(4) Of course, the lime producer has been working hard but it hasn't brought the answer. He forgets that even lime organizations must be departmentalized; that straight-thinking "key" men (not necessarily lime men, God forbid) are obtainable; that through proper instruction they will be happy to assume the details that are driving him to distraction. It is one thing to build a lime property, but quite another matter to build an organization, to staff it efficiently. A strong staff will soon allow the owner the time to devote to golf and the more ponderous problems of management. Then and only then will he fully realize the importance to his company and the industry as a whole, of more, and still more research.

(5) Probably most lime-producing readers will agree with everything I have said in the preceding paragraphs. I have, therefore, saved the most controversial subject until last so that I will not have far to run if things get too hot.

In the early 1920's operators of various types of upright kilns began to feel the need of a kiln that would burn the undersize, even if the output was suitable only for hydration. The rotary kiln seemed to hold this promise and a very few kilns of that type were installed. Due to limited knowledge, these plants were quite inefficient and, as the fuel ratio (coal-to-lime) was generally poorer than that to which they were accustomed under upright kiln practice, the venture proved to be something of a disappointment. Furthermore, even though the average rotary kiln would produce as much lime as ten upright kilns, its first cost was probably twice as great as that of the same producing capacity obtained in vertical kilns. The low labor cost of the rotary kiln was more than offset by the higher fuel input and maintenance factors.

Rotary kilns became noted for their inefficiency and for fifteen years the operators continued to take their licking without doing very much about it. Year after year the rotary kilns continued to turn out a uniformly-burned lime more acceptable to the chemical industry than the old type of lump lime. While operators were standing still, wondering what to do about their supposedly modern equipment, they were in reality slipping backward to the point where many of them find themselves today.

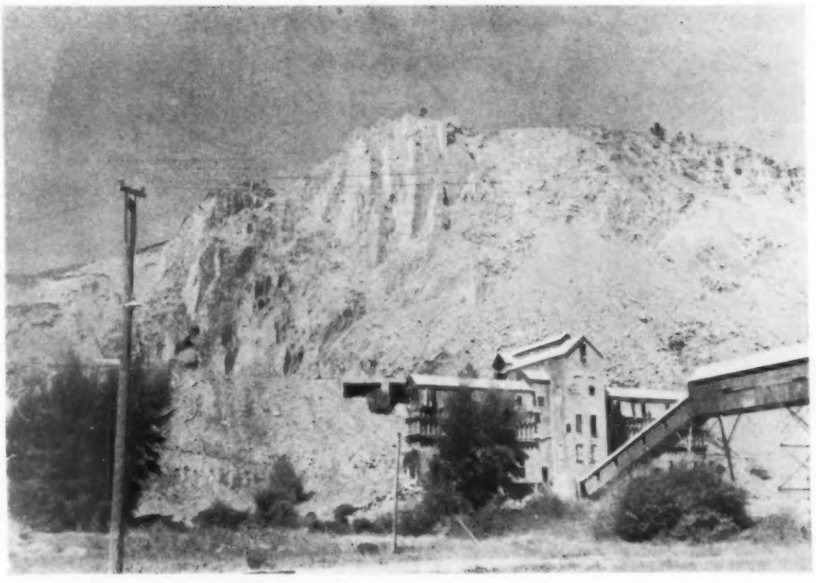
Newcomers entered the field and will continue to do so. With the new comers came a new technique, which represents the difference between "barely

(Continued on page 43)

Improvement Program Completed at Ideal's Plant at Devil's Slide

IN any field of human endeavor the spectacular usually gets most of the publicity while the more conservative majority which forms the backbone of any industry seldom gets into print. The Devil's Slide, Utah plant of the Ideal Cement Company, formerly operated as the Union Portland Cement Company, can safely be placed in the latter category, but its out-of-the-way location can be blamed to some extent for its infrequent appearance in the news. Like many other plants in this industry, it has been steadily improved over a period of years by a succession of minor changes and additions which together have combined to keep it up to latest approved production practice. Included in this plant are some features of control and operation which might well be copied in much newer plants.

The deposit at Devil's Slide was first opened in 1906 when the Union Portland Cement Company began the erection of its plant there. This plant,



This view shows the height of the quarry face and its formation. Crusher building is in foreground.

The plant viewed from the quarry with the crushing and raw-blending building at left.

which actually went into operation in June, 1907, was financed by local capital and was promoted, designed and built by the late Aman Moore. The three original 8- by 150-foot Allis-Chalmers kilns are still in use. The grinding equipment was supplied by F. L. Smidth & Company. A. F. Krabbe, now superintendent of the Olympic Portland Cement Company's plant at Bellingham, Washington, but then a Smidth engineer, worked out a system of raw-material sampling and blending which was installed in 1908. This system is still working satisfactorily and was described in the November, 1939 issue of PIT AND QUARRY.

Mr. Krabbe was superintendent from 1908 to 1916 and under his supervision many other improvements were made. In 1909 a fourth kiln was installed. The 30-cycle current used in these operations was generated at the plant and a sixth Heine boiler and a Westinghouse turbine-generator were added to the original equipment. In 1915 purchased power became available at a reasonable cost and the power plant was abandoned. Transformers and frequency-changers were installed to reduce the 44,000-volt, 60-cycle current to 2300-volt, 60-cycle and 440-volt, 30-cycle.

R. R. Dorland, who succeeded Mr. Krabbe as superintendent in 1916, has been connected with this plant since it was built. Under his direction many other improvements have been made. In 1937 trucks replaced the electric locomotives and cars in the quarry.

Perhaps the most extensive improvement program ever undertaken at this plant was a 2-year program which was started in 1937 and completed early in 1939. This program was instigated by the late R. J. Morse, vice president and general manager and the details of design and construction were under the supervision of D. C. Coulson, assistant to the general manager. Included was the replacement of all 30-cycle and direct-current drives with 60-cycle motors and gearmotors. This change resulted in a 20 per cent. saving in power and eliminated the frequency changers required to convert the 60-cycle purchased current. The installation of air separators in both the raw-and-finish-grinding departments increased the capacities of these departments to such an extent that it is now possible to do all grinding with the equipment formerly used only for raw grinding. The flow sheet is so arranged that when the kilns are shut down all of the grinding equipment can be put on clinker. In 1937 direct-firing coal mills were installed on 3 kilns and a fourth was installed later in 1939. Redler kiln feeders were installed in 1938. All operations are so scheduled as to maintain the lowest possible power-load peak.

When the plant was built the cement company also built the town of Devil's Slide for its employees. This town now has a population of over 250 and consists of 60 houses, two stores and a hotel. The houses are strictly modern

and are rented to employees at a low figure. Water, light, etc., are furnished from the plant. There is a moving picture once a week and the company sponsors baseball and other athletics, rifle clubs, etc. Big game hunting and trout fishing are also favored sports of employees.

Devil's Slide is 37 miles southeast of Ogden, Utah, on the Union Pacific Railway and U. S. Highway No. 305 in a historic area. This railroad is the original coast-to-coast route which was recently made the subject of a moving picture of that name. Nine miles north at Echo is Immigration Canyon through which Brigham Young and his Mormon band first entered Salt Lake Valley.

The town gets its name from a peculiar formation of rock ¼-mile from the plant where outcropping rock on a steep mountain side looks like a huge slide. This formation and the quarry were the result of what is said to be one of the largest faults in this country. The deposit of sedimentary argillaceous limestone lies at a slope of 85 degrees and geologists say that similar stone on the other side of the fault is more than 15,000 feet under quarry level, which, incidentally, is almost exactly one mile above sea level.

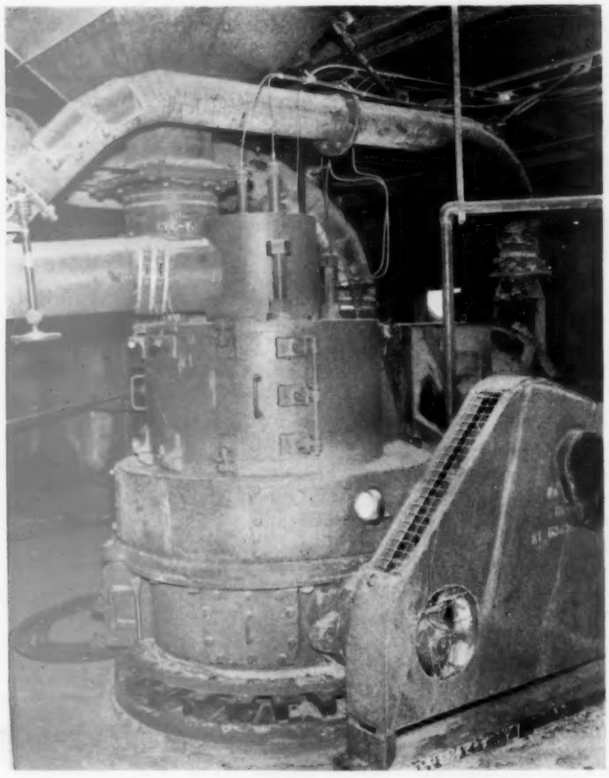
The top of the quarry face is at one point 400 feet above the quarry floor which in turn is 100 feet above plant level. The calcium carbonate content of the rock varies from low to high in different sections of the quarry and with the clay and shale in the rock and the decomposed rock overburden makes a suitable raw material.

Blasting is done by means of coyote holes on two benches. The upper level is first shot down and when the bottom holes are detonated the stone from both levels drops to quarry level, resulting in the maximum fragmentation. The last big shot was made late in 1938 and attracted considerable attention. About 380,000 tons of stone were brought down and 4,000 pounds of explosive were used. Tunnels are now being driven for another large shot to be made this year.

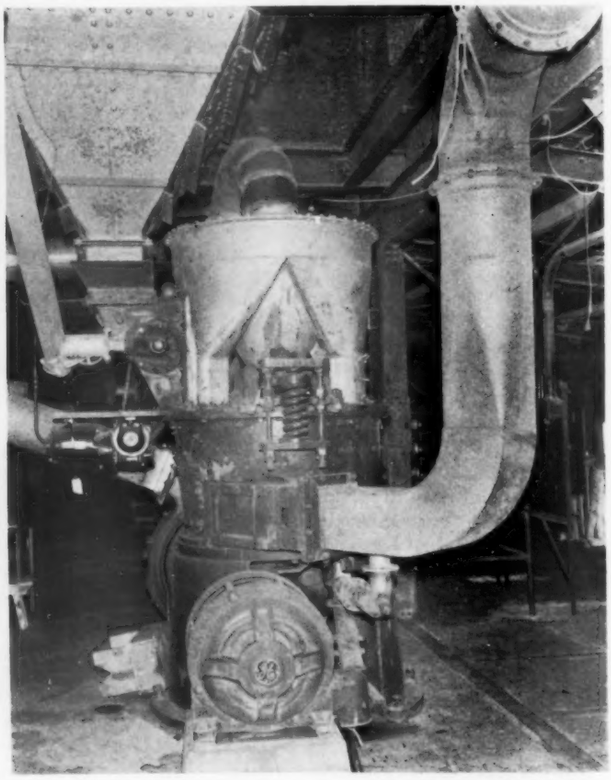
In the quarry a Marion 490 electric shovel with a 2½-cubic yard dipper loads the stone into two 10-ton White trucks. These haul the stone to the primary crusher which is at about the midpoint of and 200 feet from the 700-foot long face. Following the Allis-Chalmers No. 9 Gates primary crusher is a scalping screen and two No. 6 Gates reduction crushers. An elevator feeds the crushed rock to a distributing belt conveyor over eight 150-ton bins. These are arranged in two rows of four bins each and one row is for high- and the other for low-stone.

It is just ahead of these bins that the sampling system previously referred to enters in. After an analysis is obtained on the stone in each bin the necessary amounts of high- and low-stone are weighed out for the required raw mix. Weighing is done in two hopper scales, one of 15,000-pound capacity for high-stone and one of 30,000-pound capacity for low-stone. The contents of both scales are discharged simultaneously and gradually on a belt conveyor to the 3,000-ton raw-material compartment of the storage building or direct to the drying department. This large storage of blended raw material makes it possible to operate the chemical control laboratory only 40 hours weekly as there is always ample blended material on hand for operation over a week-end or holiday.

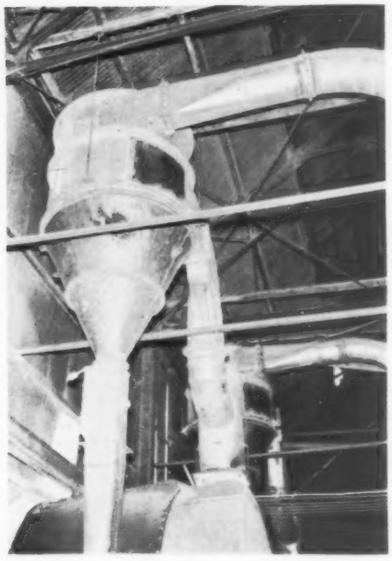
Drying is done in two 6- by 60-foot rotary driers followed by bins from which are fed four F. L. Smidth No. 66 Kominuters. One of these mills is connected up so that it can be switched instantly to clinker grinding. The raw product of these mills is elevated to two double 4- by 5-foot Tyler Hum-mer screens from which oversize is returned to the mills. Material through the screens goes to three storage bins of 100 tons capacity each. Material is discharged from these bins to a conveyor followed by an elevator which feeds a 16-foot Raymond separator with a double Whizzer. Rejects from the separator are fed through a screw conveyor and spouts into the three Smidth 6½- by 20-foot No. 18E final-grinding raw mills. The tube mill product is



The first of two ball-bearing type direct-firing coal mills installed in this plant.



One of the two direct-firing bowl-type grinding mills firing kilns in this plant.



The cyclones which remove dust from the primary air to the bowl mills.

fed by screw conveyors to the elevator feeding the separator. The separator fines are finished raw material and are carried by screw conveyors to the three kiln feed bins now in use.

This unorthodox flow-sheet has nearly doubled the former capacity of this department. Part of the credit for this increase is due to the new separator and part is due to the fact that from 10 to 14 per cent. of the Hum-mer fines is minus 200-mesh material which is removed from the mill stream by the separator without grinding. Actually about 26 to 30 per cent. of the Hum-mer fines is minus-200-mesh and the separator rejects contain about 16

Left to right: J. A. Andrews, plant engineer; V. T. Williams, assistant superintendent; R. R. Dorland, superintendent.

per cent. of minus 200 mesh. About 99 per cent. of the kiln feed will pass 100 mesh and 75 to 80 per cent. will pass 200 mesh.

Redler conveyors feed from the above three bins to the four 8- by 150-foot rotary kilns. These conveyors are inclined at the discharge ends to a height sufficient to prevent flooding of material from the bins. The Redler conveyors are driven from the kiln. Thus the rate of the kiln feed varies with changes in the kiln speed.

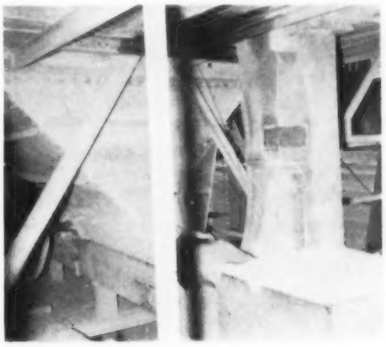
The three direct-firing coal mills originally installed (two Raymond and one Babcock & Wilcox) have been responsible for an increase of from 10 to 12 per cent. in kiln capacity with a 3 to 4 per cent. increase in the coal consumption per barrel. The 10,000-B.t.u. coal now being used has a moisture content of about 25 per cent. while the coal formerly used ranged from 16 to 22 per cent. There has also been a considerable saving in power and maintenance costs due to the elimination of two stages of grinding mills and the rotary drier formerly used to prepare the coal. A Babcock & Wilcox mill has now been installed on the fourth kiln. The four direct-firing mills are so arranged that one man can unload a day's coal requirements in 4 hours or less.

In order to prevent over- or under-

Revolving spout which takes samples out of main stone flow.

burning of the clinker a method of control has been adopted which is commonly used in European plants. Every hour a sample of clinker is taken at the discharge end of the kiln. A 1-liter sample of definite size range is cooled, screened and weighed. The density of the clinker in the sample indicates the burning condition. A perfectly burned sample in this plant will weigh between 1200 and 1250 grams per liter depending to some extent on whether it is a high or low mix. Overburning decreases and underburning increases the density and a 50 gram variation in the weight calls for a change in burning conditions. The free lime content of the clinker is checked and correlated with the clinker weight results.

Clinker is discharged from three of the kilns into three 6- by 60-foot rotary coolers. These are partly lined with brick and water sprays are used to cool their shells. A Link-Belt drag-chain conveyor under the fourth kiln takes the place of a cooler. The cooled clinker is conveyed either to a section of the 100,000 bbl. storage building or direct to the finish-grinding department. Hopper-type batch scales are used to proportion clinker and gypsum on a belt conveyor which feeds the two pre-



Chain conveyor used to feed raw material from bin to kiln.

liminary-mill feed bins and which can also feed the bin over the raw Kominuter which was previously described as being available for clinker grinding when needed. The scale operator also unloads gypsum into a track hopper. The two finish-grinding Kominuters have 8-mesh discharge screens and are in closed circuit with a double 4- by 5-foot Hum-mer screen. The fine material through the screen goes to three 100-ton bins. Star feeders control the flow of material from these bins to the three final-grinding tube mills. The speed of these feeders is automatically controlled by the amount of circulating load. These mills are in closed circuit with a 16-foot Sturtevant separator from which rejects are returned to the mills.

The separator and other improve-

(Continued on page 43)

Motor-reducer and chain drive of one of rotary coolers.

The Use of Fineness Modulus in Proportioning Concrete

By HENRY L. KENNEDY
Manager, Cement Division, Dewey & Almy Chemical Company

PROBABLY the most important step in the design of a concrete mix is to determine the proportion of fine to coarse aggregate. Yet there seems to be no one method in use for this purpose.

In a paper presented before the February, 1940 American Concrete Institute Convention,[1] it was proposed to use a method of design where the fineness modulus is used as a measure of the effective fineness of an aggregate. The proposed method, when used in conjunction with a few trial mixes, assures the designer of the optimum mix. Compressive strength is used as a criterion but modulus of rupture might also be used as a check.

[1]Published in the *Journal of the American Concrete Institute, June, 1940.*—EDITOR.

A mix designed in accordance with the proposed method uses the available aggregate in the most effective manner from the standpoint of workability, strength and economy.

The two flow-sheets, Case I and Case II, illustrated in Figures 1 and 2, show two of the basic applications of the procedure. The charts illustrated may be interchanged between the two to obtain other combinations when various other factors are known or given.

Briefly, in Case I, with the W/c, slump and maximum size aggregate given, it is possible from the top chart, *A*, to obtain the approximate mix parts. By using the top figure of Case II the mix parts may be determined from a given cement content.

The second chart, *B*, on the flow-sheets makes possible the selection of an indicated optimum fineness modulus for various maximum sizes of aggregate.

The third step in the design, *C*, is essentially the same for both cases illustrated, but may be elaborated on if three or more groups of aggregates are available. The extra aggregate groups make it possible to approximate an "ideal" type of gradation which tends to eliminate particle interference. This application is illustrated in Case II and may, of course, be substituted in Case I. In either case the percentage of each group of aggregate, which will give the indicated optimum fineness modulus, is determined.

The final step, *DE*, involves trial mixes to determine mix adjustments necessary to obtain the desired water cement ratio and strength tests to check the optimum fineness modulus for the materials involved. The latter half, *D*, of this final step may be eliminated on small jobs but will be found very worthwhile on large jobs. It is suggested that at least three mixes be made in addition to the indicated optimum, namely, two coarser and one finer than the indicated optimum value.

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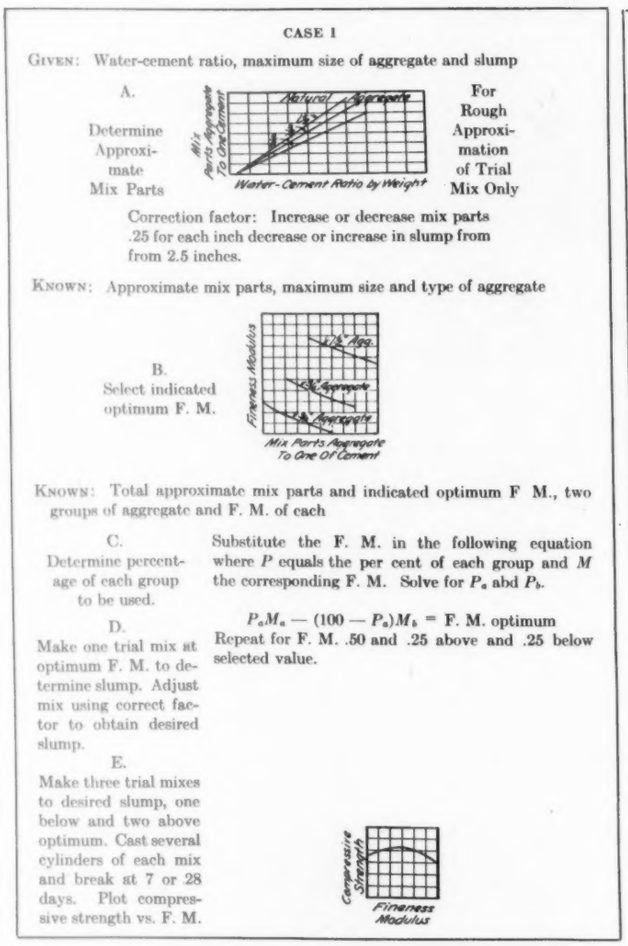

CASE 1
GIVEN: Water-cement ratio, maximum size of aggregate and slump
A.
Determine Approximate Mix Parts
Natural Aggregate
Water-Cement Ratio by Weight
For Rough Approximation of Trial Mix Only
Correction factor: Increase or decrease mix parts .25 for each inch decrease or increase in slump from from 2.5 inches.
KNOWN: Approximate mix parts, maximum size and type of aggregate
B.
Select indicated optimum F. M.
Fineness Modulus
Mix Parts Aggregate To One Of Cement
KNOWN: Total approximate mix parts and indicated optimum F M., two groups of aggregate and F. M. of each
C.
Determine percentage of each group to be used.
Substitute the F. M. in the following equation where P equals the per cent of each group and M the corresponding F. M. Solve for Pa abd Pb.
PaMa — (100 — Pa)Mb = F. M. optimum
Repeat for F. M. .50 and .25 above and .25 below selected value.
D.
Make one trial mix at optimum F. M. to determine slump. Adjust mix using correct factor to obtain desired slump.
E.
Make three trial mixes to desired slump, one below and two above optimum. Cast several cylinders of each mix and break at 7 or 28 days. Plot compressive strength vs. F. M.
Compressive Strength
Fineness Modulus

Fig. 1.—Typical flow-sheet for use with two groups of aggregates when water-cement ratio is given.

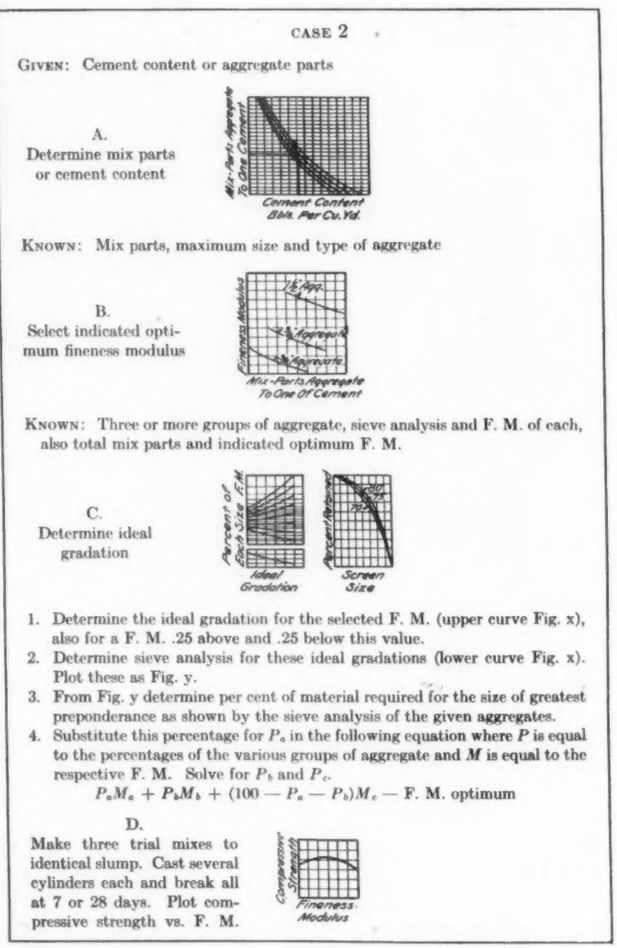

CASE 2
GIVEN: Cement content or aggregate parts
A.
Determine mix parts or cement content
Cement Content Bbls. Per Cu. Yd.
KNOWN: Mix parts, maximum size and type of aggregate
B.
Select indicated optimum fineness modulus
Fineness Modulus
Mix-Parts Aggregate To One Of Cement
KNOWN: Three or more groups of aggregate, sieve analysis and F. M. of each, also total mix parts and indicated optimum F. M.
C.
Determine ideal gradation
Ideal Gradation
Screen Size
1. Determine the ideal gradation for the selected F. M. (upper curve Fig. x), also for a F. M. .25 above and .25 below this value.
2. Determine sieve analysis for these ideal gradations (lower curve Fig. x). Plot these as Fig. y.
3. From Fig. y determine per cent of material required for the size of greatest preponderance as shown by the sieve analysis of the given aggregates.
4. Substitute this percentage for Pa in the following equation where P is equal to the percentages of the various groups of aggregate and M is equal to the respective F. M. Solve for Pb and Pc.
PaMa + PbMb + (100 — Pa — Pb)Mc — F. M. optimum
D.
Make three trial mixes to identical slump. Cast several cylinders each and break all at 7 or 28 days. Plot compressive strength vs. F. M.
Compressive Strength
Fineness Modulus

Fig. 2.—Typical flow-sheet for use with three or more groups of aggregates when cement content is given.

Slag and Stone Utilized by Detroit Plant to Manufacture Mineral Wool

INSULATION INDUSTRIES, INC., of Detroit was organized and incorporated by a group of prominent Detroit businessmen in April of 1936. The concern was first known as the Campbell Rock Wool Company after L. R. Campbell, who was originally associated with the venture. Mr. Campbell severed his connection with the company in September of 1937 and on January 1, 1938 the present name was adopted.

Soon after its organization the company purchased two acres of land and a building. The property lies adjacent to the corner of Myers Road and Lyndon Avenue and alongside the tracks of the Union Belt Railroad Company. It was purchased from the Superior Products Company, manufacturer of concrete pipe whose plant joins that of Insulation Industries, Inc., on the east.

The building was originally designed for the manufacture of concrete blocks. Most of this building had to be torn down and was replaced by a new structure. The rear part of this building, however, which is about five stories in height, contained eight large steel storage bins and a bucket elevator, which proved ideal for the receiving and storage of the raw materials needed to manufacture mineral wool.

North of this high portion of the building, in space formerly occupied by the curing rooms of the concrete-block plant, a building providing manufacturing space of about 9,000 square feet, was erected. This building is of steel and concrete-block construction with a concrete roof deck and floor and is strictly fireproof. On the east side of this building, a galvanized-iron warehouse was constructed containing 11,000 square feet of storage space. The warehouse extends south alongside the main factory building to the railroad tracks and two car-loading docks and three truck-loading docks were provided. There is a double-track railroad siding in the rear of the building; ample space and switching accommodations are available for loading cars for rail shipment and for the unloading of raw material.

A new Babcock & Wilcox 200-horsepower Stirling-type boiler was installed and is fired by oil burners. Michigan oil is used. This boiler provides ample steam for the processing of mineral wool and heat for the building and offices.

A mezzanine floor in the rear part of the old building, formerly used for the manufacture of concrete blocks, proved to be just the right distance from the main floor for the cupola-operating platform. Two cupolas of Campbell design were originally installed. One has been added since and a fourth is now under construction. The Campbell cupola, protected by U. S. Patent Number 2029307, is owned by the Campbell Process Company, a holding company which has the same group of stockholders as Insulation Industries, Inc. It is water-jacketed and lined with brick from the tuyeres to the breeching of the stack.

The Campbell patent, or process, covers a method of charging a mineral-wool cupola, concentrating the coke or fuel in the center and using the sur-

The mineral-wool plant of Insulation Industries, Inc., of Detroit.

Floor on which raw materials and coke are charged from bins into cupolas. Portable batcher is at left.

By MATT L. KUYKENDALL
Vice-President and General Manager
Insulation Industries, Inc.

Arrangement of chutes from elevator to bins.

rounding thickness of raw material as refractory and insulation. The Campbell Process has been licensed by some of the larger manufacturers and results are reputed to have shown a substantial saving in coke, which is, of course, the most expensive material used in the manufacture of mineral wool. More tons of raw material per ton of coke can be melted and more production can be obtained, resulting in a substantial saving in cost.

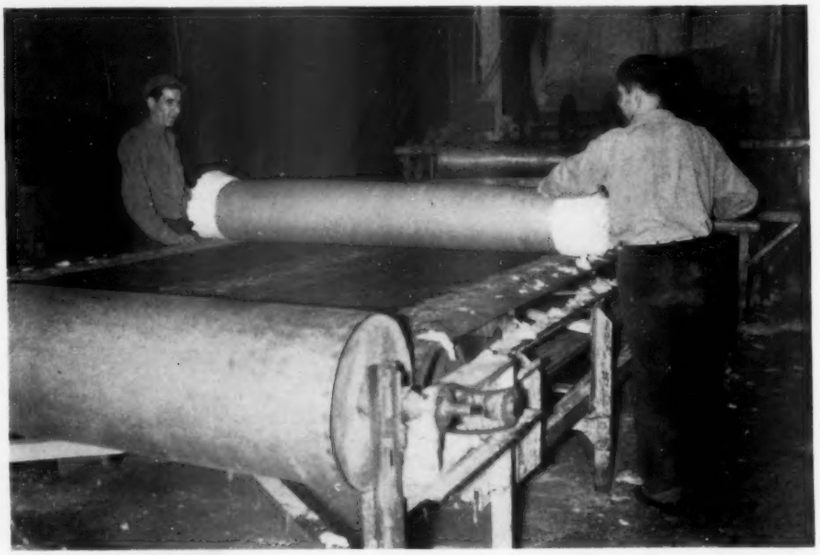
The materials used in this plant are a combination of rock, obtained from well-known deposits, known to be suitable for the manufacture of mineral wool, blast-furnace slag obtained locally, and a type of flux-rock which is obtained nearby. The material is received by railroad in hopper-bottom cars, dumped into conveyor pits in the rear of the building and hoisted by a bucket elevator into the steel storage bins.

The rock and slag are charged in the cupola with the amount of coke necessary to melt it, the draft being furnished by mechanical blowers manufactured by the American Blower Company. They deliver approximately 43,000 cubic feet of air per minute at one pound pressure. Some manufacturers are using automatic devices to assure a constant volume and pressure of air to the cupola. This equipment is very expensive and is not in general use. In this plant, the volume of air is controlled manually. The cupola is tapped from the front allowing a molten stream about ½ inch in diameter to flow from it. This stream is hit from behind, about 9 inches below the notch-hole, with a jet of high-pressure steam blown through a specially-constructed nozzle commonly called a "blow-cap." The effect of the steam upon the molten stream is to break or shear the molten material into tiny globules and propel them through the air at high speed. In their flight they are drawn into minute fibres and the result is the common or bulk variety of mineral wool.

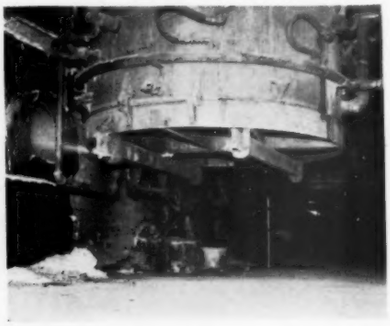
A close-up view of one of cupolas with wool being blown into "blow-room."

There are a great many different types of blow-caps, or steam nozzles, in use. Most of them are the conventional V-type with some slight variations. The length and width of the slots and the angle between them is largely a matter of individual preference. This plant uses the conventional V-type with slots 2 inches in length, 3/64 inch in width, coming together at a 30-degree angle. The steam pressure at the nozzle is 90 pounds.

During the process of blowing a light paraffine oil, usually referred to as annealing oil, is applied to the wool as it leaves the blow-cap. The application of the oil keeps the finished material from being dusty and thus prevents any hazard to workers.



Rolling up 4-inch paper insides on one of the three machines.

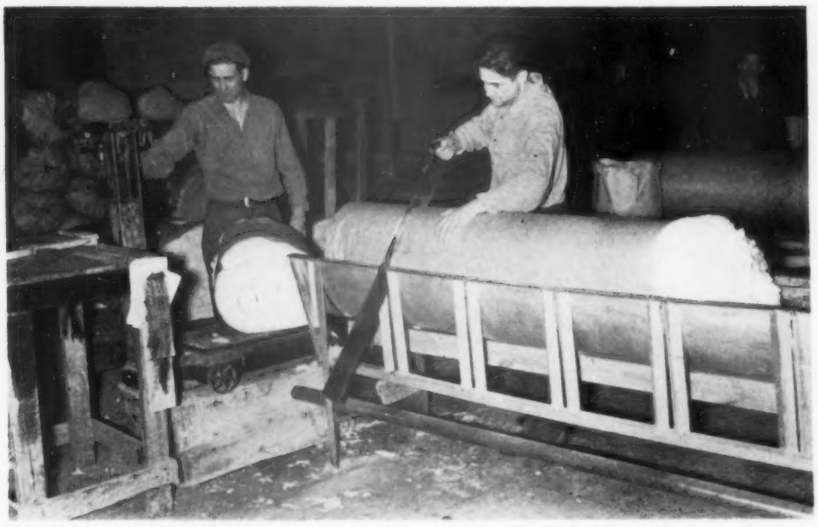


Another view of one of the cupolas and the blow room.

Wool is blown into a large settling chamber called a "blow-room." These rooms are 50 feet long, 20 feet high and 7 feet wide. In the bottom of each room is a moving conveyor of the steel-slat type attached to roller chain. The conveyor is driven by a variable-speed drive, powered with a 2-horsepower motor and can be adjusted to travel at speeds varying from 4 inches to 4 feet per minute. Mineral wool blown into this room falls in an even blanket on the conveyor and emerges from the blow chamber at any thickness desired. The speed at which the conveyor is operated determines the thickness of the material as it comes from the blow-room. The wool emerges from the blow-room in the form of a huge blanket and passes to a large receiving table the same width as the blow-room and about 20 feet in length. From the receiving table it can be packed in bags, formed into rolls or cut into batts or blankets of various shapes and sizes as the demand may require.

Circular saws slit the blanket that has been formed into any desired widths. Automatic cutting equipment cuts the material into any length required from 8 inches to 8 feet.

Mineral wool fabricated in various forms is supplied to manufacturers of



Four-inch paper rolls being cut into strips and weighed.

gas and electric ranges, refrigerators, hot-water heaters and many other types of household appliances.

Batts for the insulation of structures are made in this manner and a water-proof membrane, commonly called a vapor-barrier, is attached to the material before it comes from the machine. The batts are made in various sizes, usually, however, 15 inches wide and

Closeup of one machine showing conveyor drive and circular saws.

either 24 or 48 inches long and from 2 to 4 inches in thickness.

Mineral wool is also fabricated between various types of wire mesh, such as poultry netting, metal lath, hardware cloth, stucco lath and screen wire and is used for many industrial purposes. These materials, covered on one side with metal lath, are usually plastered and finished with insulating cement. Others are installed as oven panels between two pieces of sheet metal. The thicknesses and types of fabric vary with the many industrial uses.

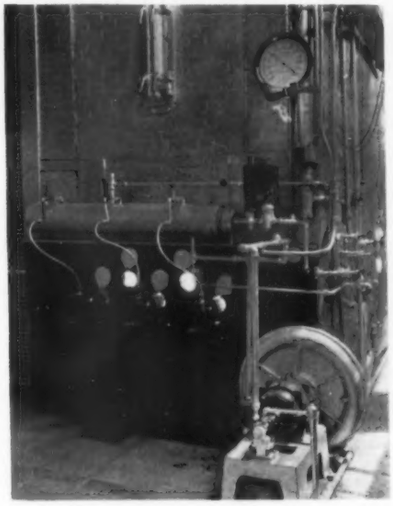
Granulating equipment is located below the floor level and a cross-conveyor carries the material directly from the blow-rooms to the granulator. From the granulator, material is conveyed to a large circular, revolving screen which removes the hard, glass-like particles known as "shot." Granulated wool is sold largely to blowing contractors who install it in existing buildings by the pneumatic method.

Because of the light and bulky characteristics of mineral wool and because of the various types of packages and shapes and sizes in which it is now manufactured or packaged, it is necessary to carry a large stock of finished material and a considerable amount of warehouse space is required. It appears now that with the increasing demand for mineral-wool products and the new uses being found for the material that even larger warehouse and storage facilities will be required in the future.

The company employs about 60 people the year around, including office workers but not salesmen. In the peak season the number of employees will increase to 85 or 90. Each employee has his own locker; drinking fountains and modern toilet and shower rooms have been installed.

Group life-insurance policies and group sickness and accident insurance policies are carried on all employees. The company pays one-half the premium and the employee, the other half. Each employee is eligible for this insurance after three months of employment. Each life is insured for $1,000 and sickness or accident benefits of $4 per day, with surgical and hospital benefits up to $150, are paid. This plan has proved popular with employees.

The company also sponsors an Employees' Advisory Council, which has



The 106-hp. oil-fired water-tube boiler which supplies steam for cupola jets.

a dinner meeting once each month during the winter. The council is composed of representatives from the management, one of the foremen, one each from the sales and shipping departments and four employees selected on a seniority basis and rotating each month until all employees with employment records of six months or more have attended a meeting.

Any and all problems that enter into

Part of the large stock of finished products carried. Bags contain granulated and long-fibre wool.

costs, maintenance, safety or efficient operation of the plant are discussed and each employee has the opportunity to advance any idea or suggestion he might have and such ideas or suggestions are discussed freely. A $10 cash prize is offered for the best idea or suggestion for improvement in operation of the plant, and the winner of the award is selected by the majority vote of the council with the management not voting. If the council is not able to select a winner, or if they agree at

These products are: left to right, rolled wool, batts in bags, granulated wool, long fibre loose wool, paper-backed batts and blanket wool.

any meeting that no idea or suggestion worthy of the award has been advanced, then the company puts the $10 into a general fund to be spent at Christmas-time for the benefit of all employees.

This plan has done much to bring about a better understanding between the employees, the management and the supervising personnel. The meetings are looked forward to by all who attend them and many excellent ideas and suggestions that have been put into practice have been developed in these meetings.

Three full-time salesmen cover Detroit and the state of Michigan. We are represented in several other cities by manufacturers' agents or commission salesmen. Our dealer sales are made to the legitimate lumber and building-supply dealers and to a few selected applicators who devote their entire time and attention to the insulation business and who qualify financially. No retail business is solicited or carried on.

The company has been a member of the National Mineral Wool Association since it entered the business and has been active in the work the association has carried on. It believes in the value of a properly-conducted trade association and feels that its association has contributed much to the success of the mineral-wool industry, its members and its customers.

Kennedy *(from page 34)*

Several specimens of each mix should be tested either at 7 or 28 days. If the results of these tests show an advantage in a slight change of combined fineness modulus, corresponding slight changes in mix can be made to obtain the final mix.

This design procedure, as illustrated by the flow-sheets, stresses simplicity of method despite the fact that short cuts are avoided. Trial mixes are recognized as being the only reliable means of assuring good mix design. Casting test specimens from the trial mixes and plotting the results as noted in the final step of both Case I and Case II results in a graphical check of the design and eliminates the personal equation.

Find Colloidal Carbon Aids Cement Grinding

Colloidal carbon, commonly known as carbon black, is an effective grinding aid in the manufacture of portland cement, according to the results of research carried out by tht Columbian Carbon Company's Industrial Fellowship at Mellon Institute, Pittsburgh.

The report of this investigation discloses that a carbon dosage as low as 0.32 per cent. on the clinker increases the fineness of the cement by 30 per cent. when the time of grinding is constant, and that the same carbon dosage decreases the grinding time by 28 per cent. when the grinding is run to constant fineness. With a 1 per cent. carbon dosage these improvements become 50 per cent. and 34 per cent., respectively. In terms of power saving and increased output these results are of practical significance. The cements prepared with carbon present as a grinding aid compared to the controls showed improved strength properties in tensile and compression tests on mortars. These benefits are attributed in the main to the increased fineness of the cement, although there is evidence that the carbon per se is contributory. The use of carbon in dosages up to 1 per cent. does not alter appreciably such standard properties of portland cement as consistency, setting time, and soundness, color excepted, and has no noticeable effect on the resistance of cement mortars to freezing and thawing treatment.

The effectiveness of colloidal carbon as a grinding aid, together with the existence of a reinforcing effect, is thought to be established by these experiments. A new application for colloidal carbon, which has already reached important dimensions, is thus indicated for the cement and related industries. The colloidal carbon used throughout this study was the grade termed "Cem Beads," a pellet form of a standard channel carbon manufactured from natural gas, with physical and chemical properties essentially similar to the colloidal carbon pigment used in the rubber industry. The diameter of the ultimate carbon particles in the pellet averages about 30 millimicrons (0.000001 inch), thus establishing the colloidal nature of the pigment.

Copies of a publication descriptive of the research may be obtained by writing to Mellon Institute.

Foundry Use Boosts Sales of Bentonite

Further expansion in consumption for miscellaneous uses and recovery in demand for foundry uses contributed to boost bentonite sales to new records in 1939. As compiled from reports from producers to the Bureau of Mines, the 1939 output in the United States rose to 219,720 short tons valued at $1,702,393 compared with 192,183 tons and $1,373,182 in 1938 and the previous record of 194,768 tons and $1,500,758 in 1937. More than 43 per cent. of the 1939 total sales were for filtering and decolorizing oils, chiefly after activation with acid, and another 16 per cent. was used by the petroleum and natural-gas industries in rotary oil-well drilling muds. Almost 25 per cent. was employed in foundries and steel works, chiefly as a conditioning or revivifying agent of molding sands. Increasing quantities of bentonite are employed for sealing dams and reservoirs, in soap making, and for a variety of other miscellaneous applications.

The main increase in production was in the Black Hills area of Wyoming and South Dakota. The output in Mississippi also has increased, but outside of Mississippi which furnished most of the sub-bentonite used in the manufacture of acid-treated bleaching clays (activated earths) it would seem that Type 2 bentonite has tended to give way to the swelling type of bentonite. A leading Wyoming producer has begun to produce Mississippi bentonite which it is claimed may supplement the Wyoming type; for certain foundry uses, particularly small iron castings and cores, it may be even better.

The most widely used bentonite is 200-mesh powder, currently worth $10.25 per ton f.o.b. Black Hills shipping point, in 100-pound bags, carload lots. However, Wyoming-type bentonite is also prepared in pellet form, 30- to 40-mesh, and a dried and finely-crushed product mostly 4 to 20-mesh is sold in carload lots at $7 a ton in bulk and $8.75 in bags. In common with shippers in other industries, bentonite producers had some difficulty in getting bags, burlap and kraft paper both having increased 50 per cent. or more in cost.

NEWER EXPLOSIVES CUT BLASTING COST

By PAUL C. ZIEMKE

IS blasting an art or a science? Well, the answer is that it is a combination of both. Successful blasting, first of all, requires experience — experience gained only through long years of studying the effect of varying charges and types of explosives on rock structures. Also required is an intimate knowledge of the several methods used to detonate explosives successfully, together with experience, which is *art*. Science does the rest.

Good execution can be achieved through careful and painstaking planning of hole spacing; accurate estimating of burdens and the charges required to move them; and, last, but by no means least, the proper methods of loading, tamping and detonating the charges.

Present business conditions make it imperative that operators analyze their plant operations thoroughly with the idea in view of lowering production costs and at the same time increasing efficiency. Since explosives constitute a very important item of expense in quarrying, their proper selection and use have a great effect on operating costs; consequently these factors should be given the utmost consideration in any analysis of plant operating costs.

The great progress that has been made in the development and use of explosives in the last few years well merits the attention of owners and operators. Modern explosives offer greater possibilities than ever, and their scientific application means appreciably lower blasting costs resulting in decreased production costs. It is estimated that about 100 million pounds of explosives is consumed annually in the quarrying industry; therefore, the explosive question enters vitally into the cost of producing stone. Often the explosive cost per ton produced represents from 10 to 15 per cent. of the total cost and, therefore, next labor, is the greatest item in the cost sheet.

High-strength explosives prove best in hard ground, although drilling and blasting vary. Taken as a general rule, in hard rock high-strength explosives will prove more effective and economical than lower-strength powders. Many operators, however, still cling to the "Judson" type powders. It is important to secure maximum fragmentation in the primary shot, thereby avoiding much expensive secondary blasting. Blasting, we all know, affects every subsequent operation, such as loading, hauling, and crushing. Therefore, if the material is not properly broken in the initial shot, the baleful effects are noticeable all along the line and production costs mount as a direct result. It has been fairly well established that no higher than 50-per cent. ammonia or gelatine dynamite is necessary; occasionally, however, as high as 60-per cent. is required in order to produce effective results.

Selection of Explosives.—When our pioneering forefathers used the blasting method, the selection of explosives was a simple matter. Since there were but two types—"straight," or kieselguhr, dynamite and ordinary black powder—the choice was indeed limited. To-day we find before us an immense array of almost every conceivable type of explosive, ranging widely in strength and physical characteristics and compounded to meet the many and varied conditions encountered in the field. Varied as the list may be, selection is still not a very difficult matter if one strives to select only the grade or strength which will consistently rate high on a performance of execution, economy and safety. Chemical engineers have devised and produced a series of explosives which economically, efficiently and safely meet our most exacting demands.

Good Execution.—When we study the properties of explosives that directly affect execution, we can briefly summarize them as follows: (1) Detonating speed, (2) Strength, (3) Consistency, (4) Sensitivity, (5) Water resistance, (6) Stability.

(1) Detonating Speed.—This is a very important consideration in an explosive, since the rate of detonation which develops is reflected in direct ratio in the shattering effect produced. Thus, a high rate of detonation is desirable in a dense, high-bulk-strength explosive loaded in "tight-rock for concentrated effect; for example, in the bottom of "cut" holes and "tight" corner holes. In the case of more friable material, a lower rate of detonation is desirable to produce a rending, heaving action.

(2) Strength.—Too often carelessness in choosing an explosive for weight and bulk strength has been the direct cause of serious blast failures. Trial shots in unproved ground are highly recommended as a means of determining this factor. In many cases a low-strength explosive of greater bulk will prove very effective rather than the denser high-strength type, because the lower strengths often can produce better shearing effect by better distribution along the full length of the hole. However, a change from a comparatively-low-strength explosive (often chosen for mistaken economical reasons) to a higher strength will often produce gratifying results. The strength of the dynamite used on a particular job is of great importance to the consumer, since this is one of the popular factors of interest at the time a change in dynamite is contemplated. The importance of the strength of dynamite when under consideration, and because of the several systems used to-day for describing the strength of dynamites, makes a brief study necessary. To begin with, "strength is that property of an explosive which is measured by the ballistic-mortar or ballistic-pendulum method, and which can be expressed as a percentage figure, based on the measurement of another type of explosive tested under similar conditions, as a unit for comparison."

Thus we begin with the straight dynamites which are marked by the manufacturer, in accordance with the percentage of nitroglycerine content, as 60-per cent., 40-per cent., etc. Then, using straight dynamite as a standard of comparison, other dynamites are marked in accordance with the nitroglycerine content of the straight dynamite to which they are equivalent in strength, that is, ammonia dynamite which has a tested weight-strength equal to that of 40-per cent. nitroglycerine is marked as "Ammonia Dynamite 40 per cent."

The comparison for the gelatins is made on a cartridge basis instead of a weight basis, but the percentage figure refers to the percentage of nitroglycerine in the equivalent-strength straight dynamite. This system, however, is not applicable in all cases, since the measured strength of an explosive is not directly proportional to the percentage of nitroglycerine. Handbooks on explosives make clear that 1 pound of 30-per cent. dynamite is not twice as strong as 1 pound of 15-per cent. dynamite and that 1 pound of 60-per cent. is not nearly four times as strong as 1 pound of 15-per cent. Percentage should really be expressed as equivalent grade instead of the strength—as a case in point, ammonia dynamite 60-per cent. equivalent grade instead of 40-per cent. strength ammonia.

(3) Consistency.—Available to-day are a wide range of explosives that vary from the resiliency and cohesiveness of gum rubber to the free-running types that can be poured as beach sand. As may be assumed, the vast differences in physical structure are also reflected in

the loss of some vital consideration. For instance, in the dense mass of gelatin dynamite increased manufacturing costs must be added and it does not readily lend itself to distribution in bore holes located in friable rock. Free-running powders, on the other hand, must of necessity sacrifice some degree of efficiency due to loss of sensitivity and water resistance and thereby perfect detonation. The old stand-by, straight nitroglycerine dynamite, is still very popular to-day for propogated blasting in drainage work and ice blasting. Long periods of immersion, however, may cause appreciable changes in the characteristics of this explosive, depending on the quantity of water absorbed.

Probably the greatest achievement in economy and efficiency is the line of high-content ammonia explosives. This product, being plastic and somewhat cohesive in nature, strikes a happy medium between the aforementioned extremities of gummy cohesiveness on the one hand and free-running powders on the other. While ammonium nitrates are bulkier than straight nitroglycerine dynamites, they also develop less localized shattering action and thus ten to heave and shear better.

Briefly summed up, these are the outstanding characteristics the average consumer is interested in. Lest the reader assume that there is one well-balanced explosive that will consistently render day-in-and-day-out execution, let it be stated that many factors must be considered. Many are the explosives, varying greatly in properties and characteristics, that will render fine execution when their use is gaged by such factors as size, spacing and depth of bore holes, loading factors, method of loading and tamping, and detonation.

(4) Sensitivity.—For reliable performance an explosive must be reasonably sensitive to insure 100-per cent. detonation. Insensitivity to detonation spells loss of ability to propogate the detonating wave through the explosive mass, and poor execution is the result. Some degree of insensitivity is desirable to facilitate transportation and handling but it must not be increased to the point where long or small-diameter bore-holes may cause serious loss of propagation. Nor should a more powerful cap than the Standard No. 6 be necessary.

(5) Resistance to Water.—With water present in many formations, the need is apparent for explosives having water-resisting qualities. While straight nitroglycerine dynamites possess this property in some degree, the gelatin dynamites are much better suited to withstand immersion (often under severe hydraulic pressures) for considerable periods of time. Probably the severest test is that wherein both excessive pressures and accompanying high temperatures tend to leach out the explosives properties. In this connection it must be mentioned that frequently explosives containing expensive water-resistant ingredients are used unnecessarily, thereby increasing the cost of explosives which could be eliminated if less water-resistant explosives were purchased.

(6) Stability.—Quality in an explosive is perhaps best expressed in terms of uniformity of composition and stability. Its chemical components must be so neutralized and balanced as to prevent spontaneous explosions. Nor may it decompose or deteriorate appreciably over a period of years under proper storage. Such explosives represent not only careful manufacture, but also intelligent, thoughtful research.

Factors that Determine Economy.—In studying the problem of effecting economies in blasting one salient fact stands out. It is a comparatively simple matter to select an explosive that gives fine execution, but it is more difficult to select one principally for economy. Several different grades may render good execution, but on close scrutiny of the cost sheet one finds that one certain grade is more economical, that is, with all other things being equal. A careful accounting of all facts will reveal true comparative costs, since economy is not merely the initial cost per hundred pounds. The cost of an explosive per ton, or per ton of properly-fragmented stone, is the true "yardstick" of comparison.

Let us give attention to the various factors that have a direct bearing on economy in blasting. As stated, the cost of explosives per ton or per ton of stone produced must head the list; secondly we place drilling and loading charges. Then we must give consideration to the differences in the cost of labor and explosives involved in secondary blasting. In this same category we must also place production interruptions due to blasting and the cost of machinery, power and labor, as it varies with the degree of fragmentation. Attention must also be given to the differences in processing expense and the production of waste material.

While the foregoing summary is somewhat general in scope, it nevertheless lists the factors of principal importance. Blasting problems may vary greatly even in neighboring quarries; thus an explosive found highly successful in one quarry may not be suited to another one near.

An important consideration in striving for blasting economy is the fact that several types of explosives involve the investment of special machinery by the quarry operator. These equipment costs, such as the initial cost, depreciation charges, and maintenance, must be added to the cost of the explosive and must be given attention when making a cost analysis. Still another consideration is that quite frequently highly-skilled blasting supervision is employed; this expense must be properly charged to the explosives economy. Usually this practice reduces costs considerably, although (as is often the case) when the selection of a new type of explosive occurs simultaneously with the hiring of a proved expert, the savings are credited to the new explosive, when, in all probability, the original explosive would also have shown improvement under skilled supervision.

Current Trend in Explosives.—To-day's trend in explosives development has been in the direction of the substitution of non-nitroglycerin ingredients for the more expensive nitroglycerine. The new products have reduced costs and produced better explosive values for the consumer. The favor, which these new compounds have met with, proves their efficiency and desirable properties. Sensitivity has not been sacrificed in favor of economy, since a sufficient ratio of nitroglycerine is retained to insure dependable detonation. The low nitroglycerine content, in addition to reducing the hazard from flame, shock, friction, and impact, also has very little toxic effect on the blaster—a most commendable attribute, to be sure, after these long years of exposure to nitroglycerine headaches.

Trial Shots to Determine Suitable Explosives.—Operators must be ever alert to changing conditions and ideas so as to select the best explosives available. Prejudices and preconceived opinions are apt to lead one "far off into weeds" in making a choice of explosives. Too often the refusal to try a new compound is an admission that one is not alert to new possibilities. Trial shots made with a free mind often produce surprising and convincing results.

Safety.—No explosive can be absolutely safe in the full sense of the word, since explosives are so constituted that they must explode in order to perform useful work. The best term one may apply is "safer explosives," since explosives can be controlled and are comparatively safe when properly handled. Safety, as applied to explosives, must include not only the explosive itself but also its handling, its use, and the conditions caused by its use.

Taken as a general rule, the least sensitive explosives offer the greatest degree of safety in blasting. Extreme insensitivity, however, does not create real safety because by reason of the insensitivity complete detonation is often difficult to achieve and the resulting misfire becomes a serious hazard.

Radial Tower Storage System Used at Dredging-Operator's New Shore Plant

View from tower looking down at preparation plant and dredge.

ONE of the pioneer sand and and gravel producers in the middle west is the Lincoln Sand & Gravel Company of Lincoln, Illinois, which has been operating since 1905. The company has had an interesting experience which has now culminated in the erection of a new plant, incorporating operating methods based on its own experience and that of others. This new plant, which went into operation early in 1939, has a productive capacity of about 400 tons per hour and can load out about double that amount. This capacity is attained through a radial tower system of storage and reclamation which has a maximum capacity of 150,000 tons. This is said to be the first dredging plant to use this system.

The company's first plant was built on a 300-acre property, 60 acres more having been subsequently acquired, and six succeeding plants were built thereon. By 1937 a lake of approximately 210 acres had been created as the result of dredging, and an additional acreage of 180 acres was leased. The old plant site was abandoned, and the new plant was erected in an area where dredging could be carried on for many years without moving the plant. At various times the company has operated four other plants, two in Illinois, one in Iowa, and one in Ohio. The present plant is the largest and most efficient yet operating, all of them being dredge operations.

The deposit at the present plant is over 60 feet in depth, but excessive fines at this depth usually limits dredging to 45 feet. The deposit now being worked contains about 35 per cent. gravel, of which a considerable portion must be crushed. An interesting sidelight is the fact that these operations (being in a bituminous-coal producing area) have been carried on over coal mines underlying the present acreage at a depth of 265 feet.

The overburden, which averages about 6 feet in depth, is excavated by a Northwest gasoline drag-line with a 1¼-cubic yard Page bucket. Two Koehring 4-cubic yard Dumptors haul the dirt, either to waste in the adjoining lake, or for use in constructing new land adjacent to the plant. A dike has been built of overburden to protect the property from the seasonal flooding of a near stream. The waste material has also been used as fill for roads and railroad trackage. These machines were purchased in 1934, and have been used steadily with remarkably low operating and maintenance expense. At present they are hauling over an average distance of 800 feet one way with a combined capacity of 500 cubic yards in a 10-hour day. On a 200-foot haul they will handle 1,000 cubic yards daily, consuming around 14 gallons of gasoline. The overburden sometimes extends a few feet below normal water level and a 10-inch pump, mounted on a dredge, is used when necessary to lower the water level so as to insure proper stripping.

View looking down into the storage tower showing gates discharging onto belt-conveyor.

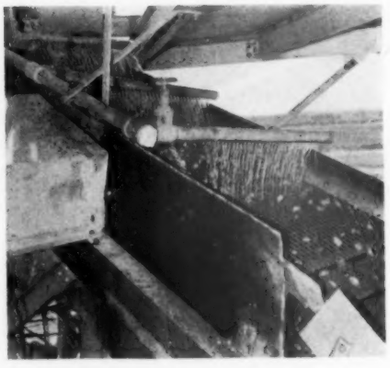
The crane in the foreground operated the stock-piling scraper of the radial storage system before the rail-mounted head tower was installed.

The dredge which supplies the plant, is of standard design with a wood hull and steel A-frame. The 10-inch Amsco pump is driven by a 300-horsepower, G.E. variable-speed motor. A 50-foot suction intake, with an enlarged hood, is used, and the material is discharged through 700 feet of 10-inch pipe with a 22-foot head. Quaker City suction hose and flexible connections are used. According to H. D. Clouse, general superintendent of the plant, it has been found economical to repair the manganese-steel pump shells by building them up with electric welding, provided the work is done before they are too much worn. The normal life of a new shell is 1½ years, and welding adds about 50 per cent. The discharge line from the dredge is inclined 45 degrees and empties on a fanning table which is 25 feet long and 30 feet wide at its lower end, and has a 5-degree slope. The velocity of this discharged water and material is broken by a vertical spreading plate. At the lower end of the table is a set of stationary screens set at a 45-degree angle. The first screen, of 2-inch mesh wire cloth, rejects oversize gravel and foreign matter; a ½-inch screen protects the 8-mesh screen which makes the separation between the sand and the gravel. Screen sizes can be changed as necessary. The gravel flows to a 4-foot by 8-foot Universal Screen with 8-mesh cloth for dewatering and further sand removal. From this screen the gravel moves up to the central storage tower on an 18-inch belt-conveyor on 285-foot centers. Material rejected by the 2-inch screen falls on a 20-inch belt-conveyor on 30-foot centers, which feeds a 2-foot by 4-foot Robins Gyrex screen with a 3-inch mesh wire cloth. The material rejected by this screen goes to a small hopper and is wasted. Gravel passing through this screen goes to a Symons 2-foot cone crusher, from which it is discharged on the gravel belt.

Drag-line loading one of the dump tractors.

A view of the dredge with plant in the background.

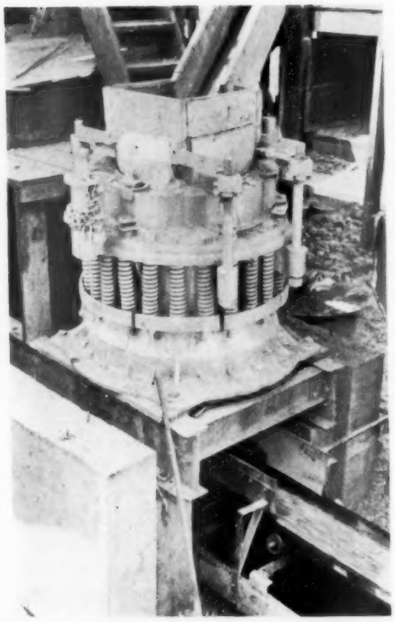
From the stationary sand screen the sand is carried into a V-shaped wooden settling bin which is 8 feet wide at the top, 8 feet deep and 30 feet long. From this bin the sand and some water flow to a concrete sump, in which a Simplicity all-steel dewatering wheel operates. This so-called "wheel" is something new in the dewatering of sand. It is 14 feet in diameter, 3 feet wide, and has 24 -buckets with perforated metal bottoms for dewatering. The wheel is submerged 5 feet in the sump, and is driven at a speed of 2 r.p.m. by a 10-horsepower motor, operating at 1.200 r.p.m. The reduction from 1,200 to 2 r.p.m. is achieved through a chain-and-sprocket speed-reducer built in the company's shops. In ordinary operation this wheel handles at least 200 tons of sand per hour, and is reducing the water content to about 12 per cent. The wheel can be slowed down and will reduce the moisture content considerably.



Double-deck screen used for coarse sizing.

The dewatered sand from the wheel is chuted to a 24-inch belt-conveyor operating at 300 feet per minute on 185-foot centers with a 17 per cent. elevation. At the end of this conveyor a reversible shuttle conveyor, set at right angles, discharges the sand into a stockpile on either side of the main conveyor. Thus, the sand can be allowed to drain before being loaded, or, if that is not desired, it can be dropped from the main conveyor to another running direct to live storage.

The gravel is discharged from the main conveyor belt on a 3-foot by 6-foot Simplicity screen with three decks: The top, 1-inch wire mesh cloth; the intermediate deck, ¾-inch; and the bottom deck, ½-inch. Material passing through the bottom deck goes to a 3-foot by 8-foot Robins Eliptex screen with ¼-inch and ⅛-inch cloth, respectively, on its two decks. The sizes usually produced on these screens are buck shot, ¼-inch, ½-inch, and 1½-inch gravel. The different grades are chuted to six compartments radiating from the Kern central storage tower. Each compartment has a live, or free-flowing, capacity through the tower of 3 carloads. If the dredge is not operating, additional material can be pulled in, or, if the dredge is operating and it is not desired to load but to store, material can be pulled out away from the central tower. Any desired



Cone-crusher above the gravel belt.

single size or any blend of various sizes stored can be loaded out through the tower. Control of the two screens and the two tower conveyors and of blending and loading-out is centered in a one-man control room under the screening floor. The six gates opening on the loading-out belt are lever-operated and are notched for accurate blending. A telephone system connects the control tower, the loading tower, the dredge,

The discharge side of the dewatering wheel.

the dewatering plant, the plant office, and the shop.

The storage tower is off the center of an elliptical dike, on which a 3-rail track is built, and on which the hoist for storing is operated. Thus, in a de-

Screen used for fine sizing in the tower.

posit of this sort greater capacity for sand and fine sizes of gravel is gained. The storage and the reclaiming out of storage are being done with a Sauerman, electrically-propelled, 1½-cubic yard reversible scraper, operated by a 2-drum electric hoist. This hoist is mounted on the 3-rail track, which completely circles the storage area.

In the basement of the central tower the different materials are fed to a loading-out conveyor 30 inches wide on 156-foot centers. This conveyor discharges through a selective gate to either of two spouts, one for loading cars and the other, by means of a short conveyor, for retail bins for trucking. These spouts and the short conveyor are operated by 1-horsepower motors. Loading into the cars or loading into either one of the six retail bins is handled by one man. Cars are "spotted" for loading in trains of 10 by a steam locomotive and moved along, as loaded, by an electric car-mover. When loaded, the locomotive, operating over 4½ miles of company track, connects with three different railways.

The plant, with the exception of the Kern radial storage system, was designed by company employees. Robins conveyor belts, with anti-friction idlers and pulleys, are used throughout the plant. The conveyors are supported by steel trusses furnished by the Fred T. Kern Company and are driven by Crocker-Wheeler moisture-proof motors through Falk speed-reducers.

The plant, including the dredge, screening and storage, as well as the loading-out facilities, has a total connected electrical load of 540-horsepower. The screens are equipped with Ludlow-Saylor wire cloth and are driven by Gates V-belts. Lang-lay wire rope of various makes is used. Complete machine and repair shops, as well as garage room for Dumptors, a truck and a bull-dozer are located adjacent to the plant, as are also the plant office and the truck scales.

Ideal *(from page 33)*

ments made in this department are credited with increasing the output of each mill from 20 to the present average of 30 barrels of standard Portland cement per hour. This has been accomplished with a considerable increase in fineness. The finished cement tests 1550 sq. cm. per gram on the Wagner turbidimeter and 1480 on the Klein turbidimeter. It averages 98 to 99 per cent. through 200 mesh and 90 to 94 per cent. through 325 mesh.

Late in 1939 Sly dust collectors were installed in the finish-grinding department. These are connected to the tube mills, Kominuters, conveyors, elevators and screens. All equipment is vented to the tube mill and Kominuter feed bins and these bins in turn are vented to the dust collector.

The finished cement is carried by a series of screw conveyors and elevators to a concrete-walled stockhouse with a capacity of 75,000 barrels. Sacking is done by four 3-tube packers. Dust from the packers, conveyors and elevators and from the reclaiming tunnels under the cement storage is removed by a system of suction piping to a storage bin used as a dust collector. Both standard "Red Devil" and Ideal "Quix-strength" high-early strength cements are made in this plant.

The officers of the Ideal Cement Company are Charles Boettcher, president and general manager, and C. K. Boettcher, vice-president and treasurer. The Devil's Slide organization consists of R. R. Dorland, superintendent; V. T. Williams, chief clerk and assistant superintendent; J. A. Andrews, plant engineer; A. E. Lucas, chief chemist.

The Ideal Cement Company, Denver, Colorado, also has cement plants at Trident and Hanover, Montana; Portland, Boettcher and Concrete, Colorado; Superior, Nebraska; Ada, Oklahoma; and Okay, Arkansas, and recently purchased the plant of the Gulf Portland Cement Company at Houston, Texas.

Calx *(from page 30)*

making ends meet" and realizing a substantial margin of profit. So rapid and so great has been the advance made in the past five years that recognition of the rotary's kiln's principles will probably mean the rehabilitation of the lime industry. There is nothing wonderful about it, only the application of principles and practices of more progressive industries.

The great strides of the past five years make definitely obsolete much existing lime-producing equipment regardless of its type. More than ever before an obsolescence rather than a depreciation charge should be of paramount interest to operators. Progressiveness is indicated by those companies insisting on maximum obsolescence rates, because, in order to maintain a position of leadership, they must charge off their equipment at the highest speed commensurate with sound accounting practice. The other school of thought, in order to make the best possible showing to bond and stock holders, is forced to depreciate at minimum rates.

The lime industry must, therefore, if it is to approach the efficiency of other industries which it serves with an indispensable basic product, expect to obsolete its operating equipment every ten years.

A ten per cent. obsolescence charge—which is not too much when consideration is given to the fact that this equipment must be of especially rugged character in order to withstand 24-hour operation year after year—conscientiously set aside will do more to correct existing weaknesses in the basic structure of the lime industry than any other single factor.

Making Depreciation Work FOR You

By PHILIP H. KLINE
Formerly Supervisor, Construction Plant Operations,
Tennessee Valley Authority

DEPRECIATION is like Mark Twain's weather; everyone talks a lot about it, but does not do much about it. There are, however, shelters or methods that can be set up to protect the owner of equipment from suffering from sudden effects of prolonged exposure. The elements of depreciation are: (1) first cost, (2) salvage, and (3) the value lost while the equipment is owned. Any plant operator can watch these elements throughout the life of any machine and actually turn that knowledge to his advantage. Although this article chiefly discusses movable equipment, which is particularly well handled by the treatment shown, it will be evident that stationary plant equipment which is more permanently installed and operated can be handled along these lines to a similar advantage.

An owner of equipment need not be confused with bookkeeping entries or adjustments, or technical financial reports; after all, the money has been spent and the equipment he owns now represents his investment. What he wants to know is actually in what shape his plant now stands—or what has been invested — or where he will stand next month or next year. This knowledge may be represented by a simple chart showing him expected investment trends of one machine or a group of similar equipment.

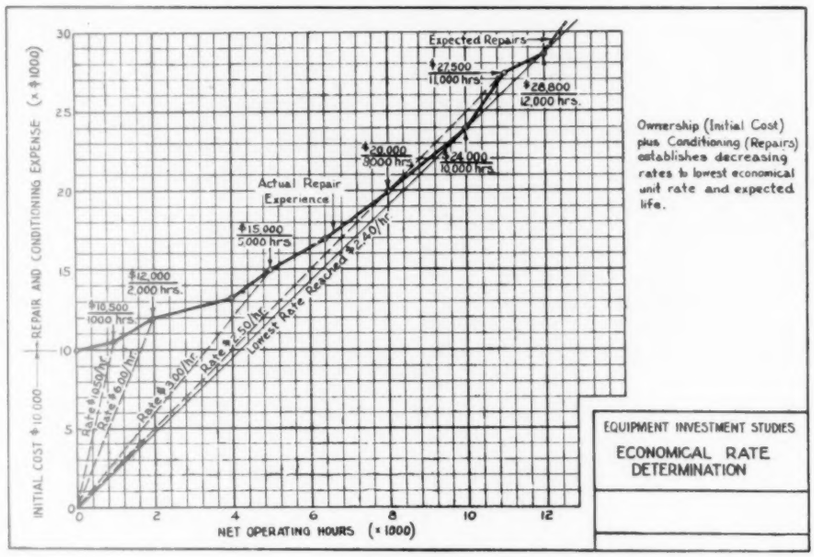

INITIAL COST ÷10,000 —— REPAIR AND CONDITIONING EXPENSE (x ÷1000)
NET OPERATING HOURS (×1000)
Expected Repairs
÷27,500 11,000 hrs.
÷26,800 12,000 hrs.
÷20,000 8000 hrs.
÷24,000 10,000 hrs.
Actual Repair Experience
÷15,000 5,000 hrs.
÷12,000 2,000 hrs.
÷16,500 1000 hrs.
Rate ÷3.00/hr.
Rate ÷3.50/hr.
Rate ÷2.40/hr.
Lowest Rate reached ÷2.40/hr.
Ownership (Initial Cost) plus Conditioning (Repairs) establishes decreasing rates to lowest economical unit rate and expected life.
EQUIPMENT INVESTMENT STUDIES
ECONOMICAL RATE DETERMINATION

Figure 1.

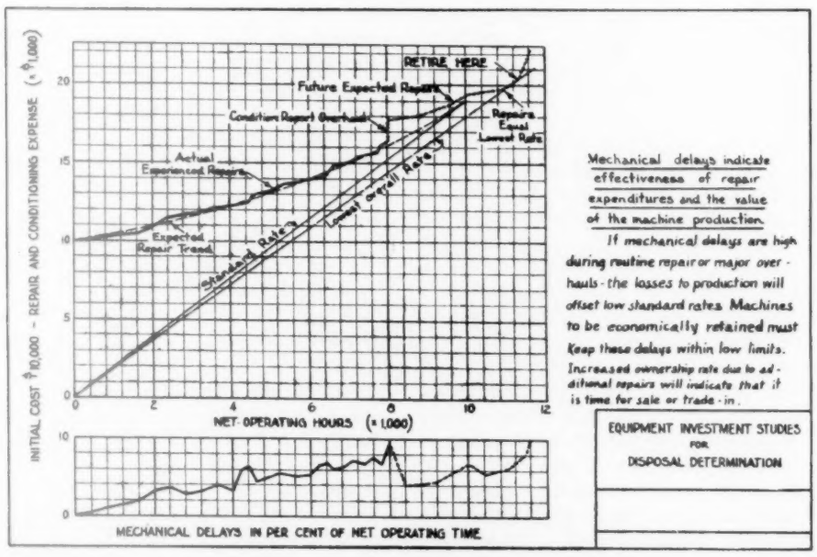

INITIAL COST ÷10,000 - REPAIR AND CONDITIONING EXPENSE (x ÷1,000)
NET OPERATING HOURS (×1,000)
RETIRE HERE
Future Expected Repairs
Condition Report Check-ups
Repairs Equal Lowest Rate
Actual Experienced Repairs
Expected Repair Trend
Standard Rates
Lowest Overall Rate
Mechanical delays indicate effectiveness of repair expenditures and the value of the machine production.
If mechanical delays are high during routine repair or major overhauls - the losses to production will offset low standard rates. Machines to be economically retained must keep these delays within low limits.
Increased ownership rate due to additional repairs will indicate that it is time for sale or trade-in.
MECHANICAL DELAYS IN PER CENT OF NET OPERATING TIME
EQUIPMENT INVESTMENT STUDIES FOR DISPOSAL DETERMINATION

Figure 2.

The equipment he has is really so much ordinary material which has been manufactured, assembled, delivered, tested, and adjusted. This he can call first cost. A simple equation for depreciation is:

First Cost minus	*Salvage* equals	*Depreciation*
Raw products	Sale	Wear and tear
Manufacture	Trade-in	Decay
Assembly	Junk	Inadequacy
Delivery	Removals	Loss of life (efficiency)
Testing		Obsolescence
Adjusting		
Trial runs		

By adding more terms, such as "rebuilding," "betterments," "additions," etc., the record can be made clearer and he will become acquainted with the physical relationship of his investment. To make depreciation work for him he outlines a grouping of such a record, expressed in a common denominator—dollars. Note that, in this study of his equipment, he has eliminated running expense, such as operators' wages, fuel, lubrication, storage, and transportation. The operating factors are important, and he does not neglect them in getting complete production costs, but for depreciation purposes he confines himself to the money and material that are invested in the machine. Some owners may wish to include interest, taxes and insurance, overhead, and routine inspection fees. These are allowable if consistently applied to all plant items.

The best approach to a depreciation study is the simplest one that will be most often referred to and used. According to the list of elements above, the producer records only three groups of "ownership" expense. With any two totals known, the third can readily be determined. "First cost" and its components are easily established, and if this part of his equipment investment is properly classified and recorded, a major step has been provided. A simple classification for equipment asset accounts follows. Allowance is made for

separation with each group listed.

000—Hauling equipment
100—Compressed-air and drilling equipment
200—Excavating and surfacing
300—Hoisting
400—Pumping
500—Marine
600—Concrete and aggregate
700—Electrical
800—Yard machinery
900—Unassigned

More serious in its relation to the delivered cost is the money spent to maintain or condition the equipment. This expense easily runs to over 200 per cent. of the purchase price of the machine, and on some jobs the repair expense is from 5 to 15 per cent. of all pay-roll charges. The owner must realize these expenditures and must protect himself from excessive repair and from quick depreciation as the machine is used from month to month. The machine when new is capable of producing a certain number of full units of work (yards, tons, miles, or hours). As it wears out, the machine will be "conditioned" to keep up the pace of production. Throughout its entire life its first cost, plus the monies spent to condition the equipment, is the total expense that can be applied in regular installments as the machine turns out work. This is best applied by a combined use-rate of first cost and conditioning, or "ownership rate."

Repair expense is not directly proportional to production. Part "a" will last one month; part "b," two months; part "c," three months; and so on. At the end of twelve months the users have conditioned the machine twelve times with part "a," six times with part "b," four times with "c," etc. Every month the machine wears out all or a portion of each piece of its assembled parts. Therefore production costs during the first four or eight months, and in every month of use, should stand a part of future as well as present replacement expenses. The owner, knowing this, charges his production with a use-rate during the first few and all succeeding months of operation of the machine. Thus, the user of a $1,600 machine may spend $2,000 more on it for conditioning. The total, $3,600, over a 36-month life has a monthly charge of $100 due to investment and repair. If the $2,000 is not spent, the $1,600 capital invested may not be used up to the best economical advantage. So repair is then a means of extracting full capital investment. It is really an anticipated future commitment when the machine is bought and placed in service. As such, it can be capitalized as it is incurred, as the owner *expects* this additional investment in order to convert the whole original equipment value to other production values such as cubic yards of material excavated or of concrete mixed, feet of holes drilled, tons of product loaded out, etc.

Table I—OWNERSHIP VERSUS OPERATING EXPENSE ON VARIOUS PRODUCTION OPERATIONS

Type of Service	Equipment Used	Ownership [1]	Operating [2]
Loading and hauling dirt	12-cu.yd. scrapers and tractors	70%	30%
Quarry excavation	3-cu.yd. electric shovel	70%	30%
Quarry hauling	12-cu.yd. dump trucks	64%	36%
Loading dirt	Elevating grader and tractor	60%	40%
Hauling dirt	8-cu.yd. tractor-trucks	54%	46%
Unloading aggregate	Whirley cranes, 2½-cu.yd. bucket	45%	55%
Hauling passengers	5-ton stake-bus truck	43%	57%
Hauling supplies	3-ton stake body truck	40%	60%
Placing concrete	Whirley cranes, 2-cu.yd. bucket	36%	64%
Hauling cement	7½-ton tank trailers	36%	64%
Hauling concrete	10½-ton locomotives	22%	78%
Drilling grout holes	5½-in. core drill	18%	82%

[1] "Ownership" includes first-cost write-off, repairs, shop burden (on labor), warehouse burden (on parts).

[2] "Operating" includes labor, drivers, flagmen, fuel, oil, grease, supplies, moving, and miscellaneous expense.

The owner must have an idea of what he expects to get through the life of the machine in terms of measurable production units. From his experience he estimates the total number of production units and divides that figure into the total estimated ownership and conditioning expense. The resulting rate per cubic yard, ton, mile, or hour is the one he should apply in order to watch the investment relationship of his machines. He wishes to recapture in service as large a portion of the original and conditioning expense as is possible, and *the rate must be as low as he can make it.* Standard charts, similar to Figure 1, indicate how this rate may be effective in assisting in the analysis of equipment investment. The relation of repair bills and first cost to their portion of production expense also changes from cubic yard to cubic yard, hour to hour, or mile to mile.

In Figure 1 the owner started with

Table II—TYPICAL USE-RATES OF MAJOR EQUIPMENT UNITS

Equipment	Description	Use-Rates in Dollars Per Net Operating Hour
Hauling Equipment:	Gas or gas-electric, 8-ton	$0.95
Locomotives	Diesel or steam, 30-ton	1.40
Tractors	Gas with bulldozer, 35-hp	1.60
Trucks	Gas with bulldozer, 50-hp	2.10
Wagons	Gas with bulldozer, 70-hp	2.25
Drilling Equipment:	Diesel with bulldozer, 80-hp	2.50
Core Drill	Dump, 1- to 2-cu.yd	0.65
Excavating, Grading and Surfacing Equipment:	Dump, 4-cu.yd	1.25
	Dump, 8-cu.yd	2.00
Ditcher	Dump, 12-cu.yd	2.40
Graders	Stake, 2-ton	0.60
Roller	Stake, 5-ton	0.95
	Stake, 12-ton	1.40
Scraper	Truck wagon, 10-cu.yd	2.50
Shovel	Crawler wagon only, 10-cu.yd	0.80
	Gas engine, 2- to 5-in. hole	0.60
	Electric, 36-in. hole	1.20
	Crawler, gas, 8 ft. 3 in. by 24 in	2.50
Hoisting Equipment:	Auto patrol, 10-ft. blade	1.15
Cranes	Elevating 28-in. plow	3.00
	Road, gas, 8-ton	0.95
	Road, gas, 10-ton, 3-wheel	1.00
Derrick	Carry-all, 12-cu.yd., cable control	1.00
	Gas, ½-cu.yd. with drag-line attachment	2.00
Marine Equipment:	Gas, 1¼-cu.yd. with drag-line attachment	3.20
Towboat	Diesel, 1½-cu.yd. with drag-line attachment	3.20
	Electric, 2½-cu.yd. with drag-line attachment	6.50
	Locomotive, steam, 5 tons at 40 ft.	1.50
	Revolving electric, 5½ tons at 90 ft	2.50
Yard and Miscellaneous Equipment:	Revolving electric, 11 tons at 125 ft	4.50
	Steel, skid, boiler and 2 hoists	2.20
Loader	Floating, 5½ tons at 90 ft	3.60
	Wood, gas, 50 by 12 by 2-ft., 50-hp	1.60
	Steel, gas, 40 by 10 by 4-ft., 165-hp	1.60
	Steel, diesel, 50 by 12 by 4-ft., 180-hp	3.20
	Steel, steam, 112 by 27 by 4-ft., 400-hp	4.00
	Crawler, bucket, gas	1.15

his original investment, say, $10,000. At the end of 1,000 hours the machine had cost him $10.00 an hour plus conditioning expense for parts which were worn out during that time and were replaced so that the remainder of the parts could be converted into service. Say that that expense was $500, he then had a total cost of $10,500, or $10.50 per hour. At the end of 2,000 hours his total expense was $12,000, the rate then being $6.00 per hour. At 5,000 hours the rate was $3.00; at 8,000 hours, $2.50; and at 10,000 hours, $2.40. He found that the next 1,000 hours included such replacement expense that the rate increased to $2.50, but he hoped for more lasting results, and at 12,000 hours he reached the $2.40 rate again. However, more replacements were due and it appeared that his lowest rate of first cost and repair had been reached. Thus the computed economical life of the equipment was established. He may hope to duplicate it by the purchase of a new machine; he may better it. In any event, from an investment study, this machine appears to be ready to be scrapped.

The importance of such rates is shown in Table I, *Ownership versus Operating Expense on Various Production Operations*. Since a sale price limits the production costs, the depreciation or use-rate often dictates the selection of the type of equipment to be used. The typical use-rates of major equipment units given in Table II are based on machines or service of a known character. They may be used as a guide, but repair expense and the type of service required by each owner's operations should be reviewed before he uses them as given here. No salvage value has been allowed.

By having depreciation under such favorable control an owner may forecast just how much expense he should be expected to absorb for any piece of equipment on any one contract or order, or during any portion of the machine's life. He will consult his schedules to determine the number of hours he expects his machine to run, and from other curves or repair experience he can anticipate the conditioning expense according to the age of his machine. With this information he adds the expense necessary to bring it up to normal production speed, plots it on such a chart, and arrives at the depreciation expenses which he must allow for the service he has in mind, and he can also see what investment balance he will probably have left for future use.

A graph similar to Figure 2 will show the present and future probable repairs of any machine. An increased repair trend of an old machine may be tolerated, provided the rate does not exceed the standard ownership rate or does not continue to allow unreasonable mechanical delays. If the expected rates are kept up to date they will show what the modern machines will cost to own; an old machine need not be replaced by a new one if it does not cost more than the rate would be for the later models. However, in addition to the machine losses themselves, auxiliary equipment may also be affected. A shovel loading four large trucks and having mechanical delays of over 3 per cent. above normal might increase production expense by 30 or 40 cents per operating hour. Unless an operator is working under complete daily control, such losses would not show up during such a critical age of machine life. It will be shown on curves discussed later that this critical period may show up long before the actual lowest ownership rate is reached, but these charts do indicate such machine trends and allow the fullest use of the economical machine life.

Using this type of depreciation control, a group of trucks was analyzed after they had operated 10,000 hours each. The ownership rate appeared to be still decreasing. However, there was hesitation about keeping them in service because of a fear that the mechanical delays might make their production costs high in spite of the low use-rate. An estimate of rebuilding cost was obtained from both experience and from the manufacturer. The projected amounts were plotted on the existing curves and compared with present new-truck prices. The projected

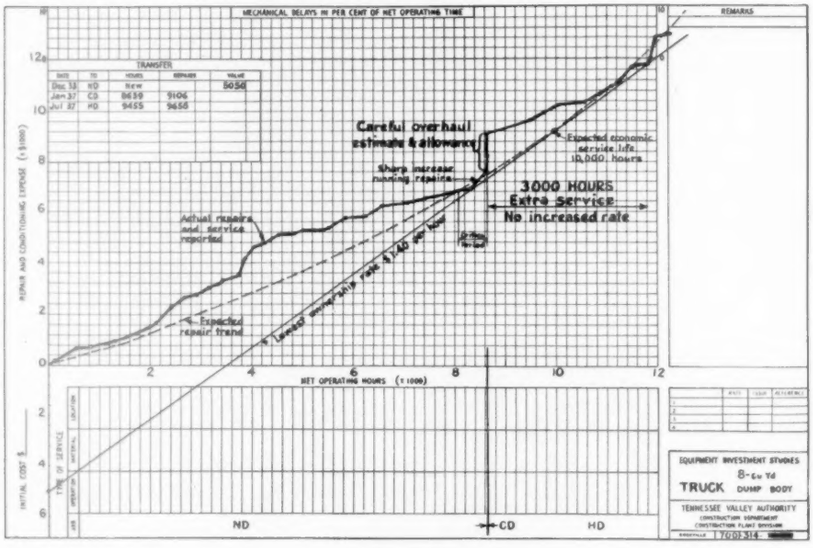


Figure 3.

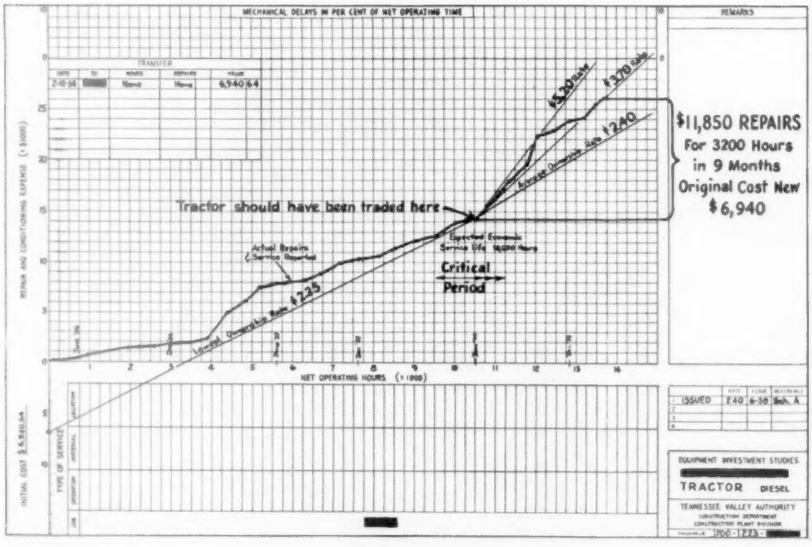


Figure 4.

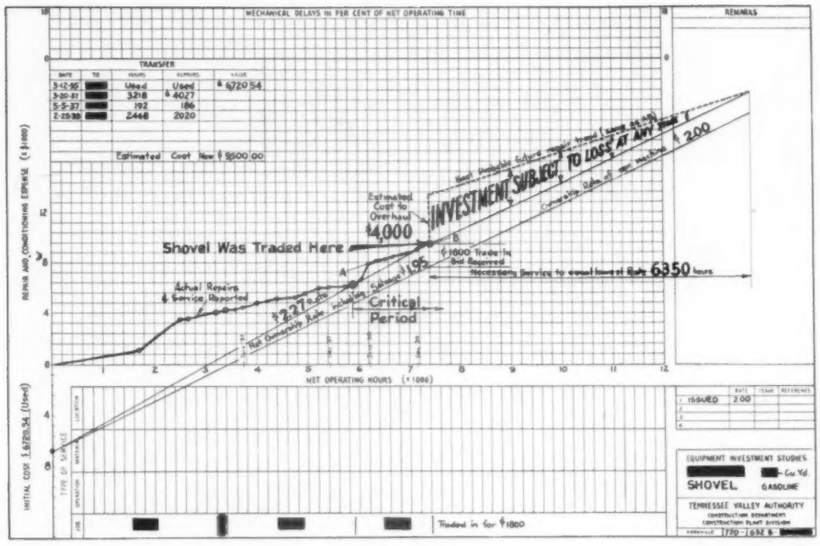

MECHANICAL DELAYS IN PER CENT OF NET OPERATING TIME
REMARKS
TRANSFER
Estimated Cost New $ 9500.00
Shovel Was Traded Here
Actual Repairs & Service Reported
Critical Period
INVESTMENT SUBJECT TO LOSS AT ANY TIME
Estimated Cost for Overhaul $4,000
Necessary Service to exceed hours at Rate 6350 hours
NET OPERATING HOURS (×1000)
REPAIR AND CONDITIONING EXPENSE (×$1000)
INITIAL COST $ 9,720.54 (Used)
ISSUED 2.00
EQUIPMENT INVESTMENT STUDIES
SHOVEL
GASOLINE
TENNESSEE VALLEY AUTHORITY
Traded in for $1000

Figure 5.

use-rate appeared all in favor of the manufacturer's rebuilding, which was ordered. Later a close check of delays and repair trends proved that the study had been correct. The manufacturer was greatly pleased with the opportunity to prove that such low-cost hauling rates were possible with his units. The owner was provided with ample facilities to carry on his work with the minimum new investment.

Every machine operator knows that the older an item of equipment becomes, the more uncertain and difficult it is to judge the question of repairs and continued operation. Most producers have some machines in this category. The samples shown below represent such cases out of nearly 3,000,000 equipment hours plotted to date.

The truck curve presented in Figure 3 shows the benefits of close supervision and careful overhaul. Though running repairs were increasing at the end of "ND" job, it was determined that the machine would serve two additional projects at little additional investment and no increase in rate.

The curve in Figure 4 shows a Diesel-engine tractor which was operated considerably in excess of its expected economic life with resultant high repairs. This case shows lack of economy and has doubtless caused considerable field delays.

The repair investment subject to loss is brought out by the shovel curve in Figure 5. The more careful procedure is to make a depreciation study when overhaul expenditures are necessary and while the machine is in its critical stage. It was obvious in the case of this shovel that a considerable amount of current expense was at stake and the chances of recovering future service at the same cost as previously obtained seemed impossible. As a result of this method, it was decided not to make the repair expenditure but to trade this machine toward the purchase of a new and more dependable unit.

Having depreciation thus working for them, equipment owners are assured of current watchfulness of their machine life. Accumulation of hours and repair data may be as simple or as elaborate as the owner feels necessary. The plotting and study of such curves provide a simple and easy way to keep depreciation under constant observation. This method takes the place of complicated formulas, sinking-fund percentages, reserve entries, and accounting analyses, and at the same time presents a reliable record from which each machine and the comparisons of many pieces of like equipment may be effectively controlled.

A.S.T.M. *(from page 29)*

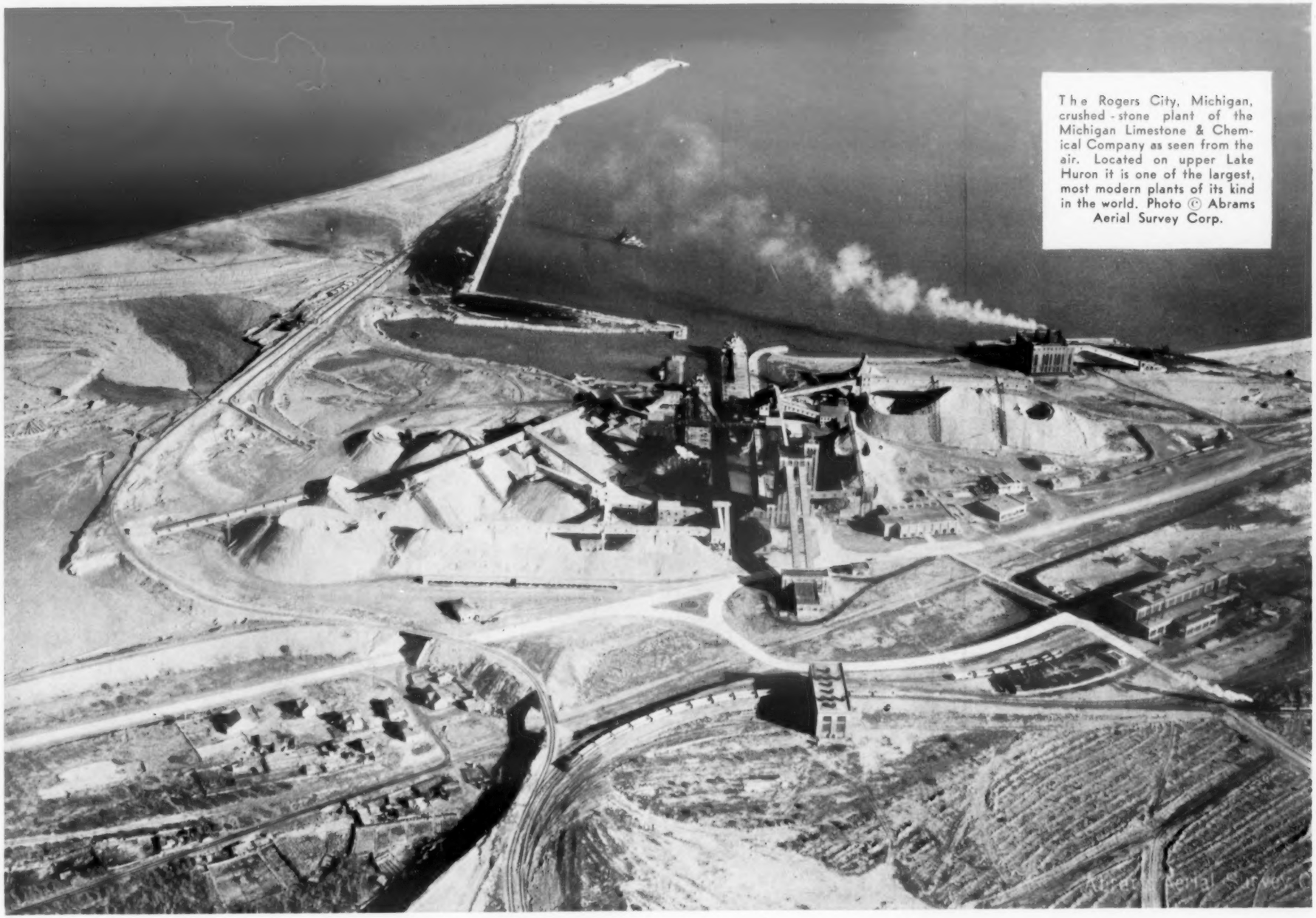
it is of distinct service in concrete design.

In presenting his paper describing the use of the dynamic method in measuring changes in physical properties of concrete, Mr. Thomson of Kansas State College reported that in investigating the durability of concrete by freezing-and-thawing tests, deterioration was accompanied by certain changes in physical properties, those most affected being modulus of elasticity and decrement of vibration. He concluded that the largest changes took place during the first few cycles of freezing and thawing and that with the method used which involved a beat-frequency oscillator there was no apparent difference in modulus of elasticity or logarithmic decrement between good and poor specimens at zero cycles of freezing. Poor specimens can generally be detected within 20 cycles of freezing and thawing.

An extensive paper by C. E. Wuerpel and E. P. Rexford of the U. S. Engineer Department, U. S. Military Academy involved *The Soundness of Chert as Measured by Apparent Specific Gravity and Absorption*. The object of the studies was to investigate the possibility of isolating the sound and unsound varieties of chert in concrete coarse aggregate by some means more precise than visual examination and more practical than microscopic analysis. Samples of cherty gravel were collected from ten areas in the southern, central, and eastern portions of the United States. These were separated into four apparent specific-gravity groups by flotation. The separated groups were analyzed microscopically and tested physically for absorptive capacity, resistance to frost action and resistance to a magnesium-sulphate soundness test. The results of the investigation indicate a close relationship between the void structure (porosity), the apparent specific gravity, and the resistance of most chert particles to freezing and thawing. The authors concluded that the separation of the unsound from the sound varieties of chert by means of the flotation test appears to be a reasonably reliable, rapid, simple, mechanical means for use in field determinations.

The paper by F. N. Wray and H. J. Lichtefeld, Missouri State Highway Department, covering *The Influence of Test Methods on Moisture Absorption and Resistance of Coarse Aggregate to Freezing and Thawing* was presented by T. F. Willis. Different testing procedures used in laboratory tests of aggregates which later were found responsible for unsound concrete were reported. The results are of value in showing why certain features should or should not be incorporated in any standardized testing procedure that is intended for giving information on any coarse aggregates in service. One of the outstanding results was that the A.S.T.M. tentative method for freezing and thawing produced less deterioration than other methods. Another result indicated that for equivalent degrees of saturation coarser particles have less resistance to freezing and thawing than smaller sizes.

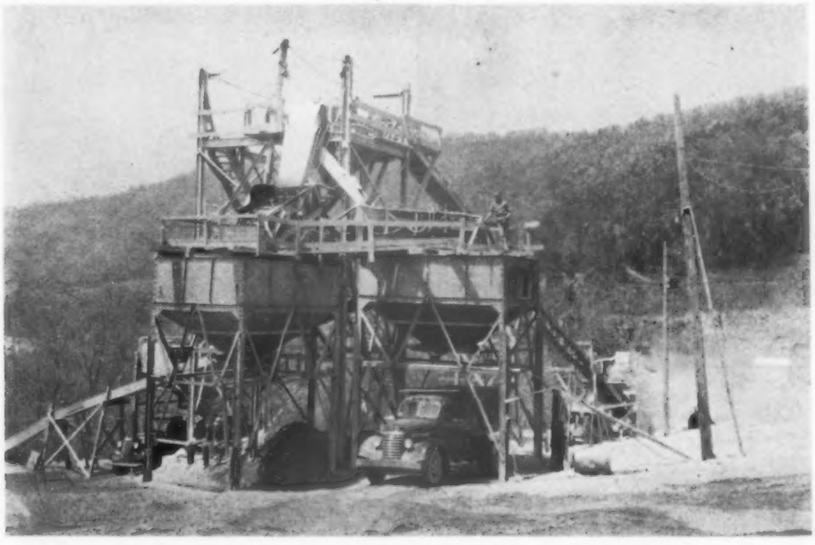
Indicating the extent of the stone trade on the Great Lakes this year, cargo space on all eight of the big self-unloading freighters operated by Boland & Cornelius of Buffalo are booked solidly ahead through the summer, according to reports.



The Rogers City, Michigan, crushed-stone plant of the Michigan Limestone & Chemical Company as seen from the air. Located on upper Lake Huron it is one of the largest, most modern plants of its kind in the world. Photo © Abrams Aerial Survey Corp.

Iowa Firm Using Portable Plants to Fill Pennsylvania Turnpike Contract

One of the haulage units feeding one of the two portable primary crushers at the Bedford plant.



The Bedford plant with truck-loading bins in foreground.

THE Pennsylvania Turnpike, connecting Pittsburgh and Harrisburg and now nearing completion, has attracted wide attention because it is the only long privately-owned toll road in this country, because it greatly reduces driving time between the Middle West and the East, and because of the many engineering problems involved. More recently the growing importance of national defense has called attention to the vital necessity for highways of this type to facilitate the transportation of men, armament, materials, etc. It is quite likely that the turnpike will prove to be the first of a series of toll or free roads designed to provide swift transportation between all important centers.

Aggregates producers are naturally much interested in highways of this type because of the potential demand for their products. This project alone requires 1,391,361 tons of crushed stone and 843,887 tons of sand. They should be gratified to know that practically all the aggregates used in the construction of the turnpike came from the plants of commercial producers and that most of it came from established permanent plants. The Pennsylvania Turnpike Commission adopted the policy of purchasing from local producers wherever possible but in some sections it was found that local producers could not supply the demand and shipping costs made purchasing from more distant producers prohibitive.

The Concrete Material & Construction Company came into the picture at this point and secured contracts for this material to be produced by semi-portable or temporary plants. This company is a subsidiary of the Concrete Materials Company of Waterloo, Iowa, one of the pioneer aggregate producers of that state. In 1933 the company found it advisable to operate portable and temporary plants to get its share of the business. In 1937 the

Shovel loading one of the tractor units in the Bedford quarry.

above subsidiary was formed to operate these plants and a crushed-stone plant at Cedar Rapids, Iowa.

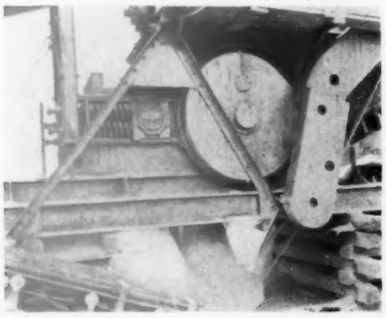
In February, 1939, a temporary plant was installed at Roxbury, Pennsylvania, where the Kittatinny and Blue Mountain Tunnels of the superhighway are only 300 feet apart. This plant supplied 10,000 cubic yards of 1- to 6-inch crushed stone for the base under the tunnel slab and the minus 1-inch rock for the slab.

On completion of this contract the plant was moved to Bedford, Pennsylvania, where additional equipment was installed. This plant is working on

Dumping a load at the Bedford crushing plant.

The Diesel engine which drives the roll-crusher and scalping screen (Bedford plant).

several contracts calling for 150,000 tons of crushed stone to be used for concrete paving. At the same time this company erected another plant near Spring Run, Pennsylvania, which is supplying 100,000 tons of concrete stone to the Union Paving Company. Both plants went into operation in March of this year. K. C. Gravenhorst and



The 24- by 40-inch roll-crusher at the Bedford plant.

Fred Fiala are in charge of these plants in the order named.

The Bedford quarry actually lies 3 miles east of that resort town. It is being leased from E. J. Kilcairn & Sons, operators of a small commercial plant, who did not want to enlarge their own production facilities to supply this temporary demand. Construction schedules call for 1,000 tons daily over a period of several months.

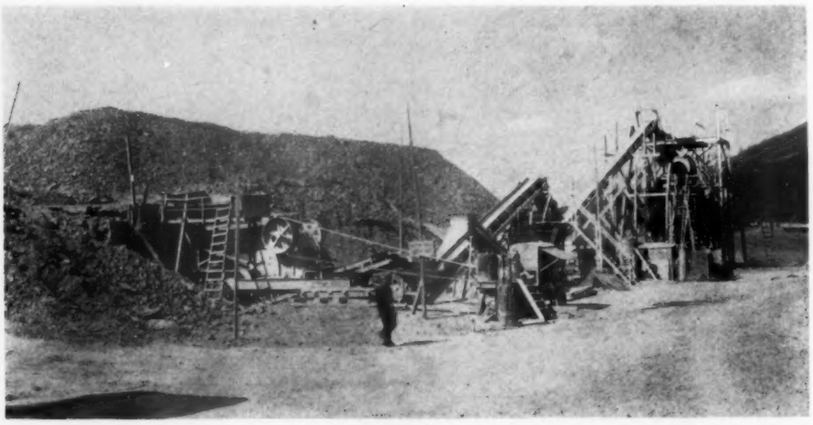
The deposit consists of limestone which meets all specifications. It is in a broken formation with nearly vertical stratification. Two Gardner-Denver wagon drills are used and air for these is supplied by two Gardner-Denver 315 cubic foot air-compressors driven by Caterpillar D 13,000 Diesel engines. Trojan 40-, 50- and 60 per cent. explosives are used. Stone is loaded by a Northwest 1½-cubic yard gasoline shovel into a fleet of four Koehring 3-cubic yard rubber-tired Dumptors. These haul the stone about 300 feet to the feeders of two Cedar Rapids 18- by 36-inch jaw crushers which are wheel-mounted. These crushers have sealed roller-bearings which need to be greased only once every 6 months. Each has a plate feeder and belt-conveyor feeding the main belt-conveyor system. A 24-inch by 75-foot conveyor is followed by a 30-inch by 40-foot conveyor which feeds the stone on a 3½- by 12-foot Cedar Rapids Symons screen. Only one deck of this screen is being used and that is equipped with 2¼-inch screen cloth. The oversize material goes into a new type 24- by 40-inch Cedar Rapids 2-roll crusher. A short return conveyor feeds the crusher product back to the conveyor ahead of the screen.

The rock passing through this screen is carried on a 24-inch by 90-foot belt-conveyor to a Cedar Rapids Sure Shake 3½- by 12-foot 2-deck screen. Material passing over the 1½-inch top deck goes over a Niagara washing screen into a bin as 3A stone. The material retained on the ¼-inch bottom deck goes over a 3- by 8-foot Symons washing screen into another bin as 2B stone. The minus ¼-inch material passing through the bottom deck is flumed to a settling basin before water is returned into a near river. Some effort is being made to sell the reclaimed fines for agstone. The split in coarse aggregates is made to prevent segregation in storage and shipment.

Trucks are loaded under the steel plant bins. The hauling is done by contract and the distances range from 5 to 30 miles. A P & H 1½-cubic yard shovel is used to store and reclaim the stock-piled materials. Shipments are weighed on a Fairbanks truck-scale.

The two primary crushers are driven by Caterpillar D 11.000 Diesel engines. A Caterpillar D 17,000 Diesel engine drives the roll-crusher, the two conveyors preceding it, and the crusher return conveyor. A PD 40 McCormick-Deering Diesel engine drives a generator which supplies current to individual electric motors driving all the screens and the last belt-conveyor. Goodyear conveyor and drive belts are used.

Wash-water for this plant is supplied by a 6-inch Allis-Chalmers centrifugal



General view of the Spring Run plant. Primary crusher at left.

Jackhammers, wagon drill and compressor in the Spring Run quarry.

pump driven by a 125-horsepower Cummins Diesel engine. Light for night operation is supplied by a small gasoline-engine-powered plant.

The Spring Run quarry is located about 50 miles west of Harrisburg in

Diesel-driven pump which supplies washing water for the Bedford plant.

the same deposit from which Sam Stuart supplies three lime pot kilns. A 24-foot face was first developed and now a second 24-foot lift is being

Trucks feed pan-feeder at left of primary crusher at the Spring Run plant.

opened. Gardner-Denver wagon drills and jackhammers are used and air for these is supplied by Gardner-Denver portable air-compressors. Trojan explosives are used.

The stone is loaded by a 1½-cubic yard Koehring 601 shovel powered by a Caterpillar Diesel engine. Two 5-cubic yard Koehring Dumptors are used for stripping and two others haul the stone 300 feet to the plant.

The stone is dumped on the pan-feeder of a Cedar Rapids 2540 jaw crusher. A short belt-conveyor feeds a 30-inch by 50-foot belt-conveyor to a Cedar Rapids Symons 3½- by 12-foot 1-deck screen. The stone over 2½ inches passing over this screen goes into a Cedar Rapids 2440 roll-crusher and is returned on a conveyor to the above screen. Minus 2½-inch stone passing through this screen goes on a 24-inch by 94-foot conveyor to a Cedar Rapids Symons 3½- by 12-foot 2-deck screen. Dust passing through the ¼-inch bottom deck goes to a bin from which it is trucked to stock-piles.

Material retained on the top deck is 3A stone and this is passed over a 3- by 8-foot Cedar Rapids Symons screen for washing before it goes to a bin. Material retained on the bottom deck of the screen goes into a Cedar Rapids 5- by 10-foot rotary scrubber and over another 3- by 8-foot Cedar Rapids Symons screen before going to storage. All these screens are equipped with Link-Belt sprays.

Trucks haul the stone under contract and all the shipments are weighed on a Fairbanks truck scale.

The "peak" demand from this plant is about 180 tons per hour for 16 hours daily. Two 10-hour shifts are worked as the plant has a capacity of about 125 tons per hour. Considerable material stock-piled in advance insures against delays.

The primary crusher, feeder and elevator in this plant are driven by a 125-horsepower Climax engine. An identical engine drives the roll-crusher and the main conveyor. All the screens and the scrubber are driven by individual electric motors for which power is provided by a generator driven by a McCormick-Deering PD 40 Diesel engine. A 75-horsepower Waukesha engine drives the pump, which supplies 1,500 gallons of water per minute to the plant through an 8-inch line from a creek. Goodyear drive belts are used in this plant and Cincinnati conveyor belting predominates.

Urges Safety Cars to Transport Explosives

Safety in transporting explosives underground is attained best by transporting each type of explosive separately in specially designed cars, states the Bureau of Mines, in a report just issued. A definite type of car has not been recommended by the Bureau, but the report gives descriptions of four cars embracing general principles that have solved the problem for four coal mining companies.

An explosives car should consist essentially of two boxes, so constructed that the inner box is insulated adequately from electric current, and should be strong enough to withstand more than normal blows, such as falls of material and similar accidental impact. It should have doors or lids that can be opened to expose only a part of the load at one time, and doors should be placed so they will not come in contact with electric power wires when opened, and employees cannot stand under power-carrying wires while loading or unloading explosives. Bumpers should be prohibited or so constructed that employees cannot ride on them.

As electric haulage is generally used, insulated couplings should be employed with this type of transportation, to prevent ignition or detonation of the explosives by stray currents. Ordinary couplings allow current, created usually when the locomotive and cars run over poorly bonded track. to pass into the car through the metallic draw bar.

Some companies provide separate compartments in explosives cars to carry detonators, but the Bureau of Mines believes this practice entails additional and unnecessary danger and does not recommend this departure from the much safer practice of transporting different types of explosives and detonators separately.

A Model 18 Bay City truck crane handling a bridge span used in constructing the 10-mile conveyor-belt line which carries aggregates to Shasta Dam in California.

A Laughlin drop forged Safety Clip takes hold of wire rope with a sure, solid grip — just like a fist. It's no rope crimping "finger pinch," but a rugged vise-like hold. Tests have proved Laughlin Safety Clips twice as efficient as ordinary "finger pinch" U-Bolt clips.

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PERSONAL MENTION

A. W. Worthington

A. W. Worthington, vice-president and general manager of the Pittsburgh Limestone Company since 1932, has been named president. A graduate of Rose Polytechnic Institute, he joined the company in 1920 as assistant to the general manager. Previously he had served as engineer in charge of construction for the Pennsylvania Railroad and erecting engineer with the Koppers Company of Pittsburgh. During the first World War he was a lieutenant and later, captain of engineers of the Advance Section in France. He is a member and past president of the University Club of Pittsburgh.

D. B. Simon, Jr., has been appointed general superintendent and Francis A. McAdam, director of research, by the Southern States Portland Cement Company of Rockmart, Georgia.

Jack Dempster, Canada Cement Company, and editor of the *News Letter* of the Cement and Quarry Section of the National Safety Council, is back at his desk after an illness which confined him to a hospital for several weeks.

C. V. Sweeney has purchased the interests of Frank Lipke in the Edgerton Sand & Gravel Company, Edgerton, Wisconsin, and is operating the business under the same name.

Harold B. Robeson, formerly vice-president and general manager, has been elevated to the presidency of the Nazareth Cement Company, replacing Milton J. Warner who becomes chairman of the board. Appointment of M. Pierpont Warner to the post of assistant to the president is also announced.

M. D. Grow has been appointed sales promotion manager of the Celotex Corporation of Chicago. He succeeds G. D. Andrews, recently resigned. Mr. Grow has been assistant advertising manager of the United States Gypsum Company.

Theron C. Tayler has established the Tayler Engineering Service at 1000 Marquette Building, Detroit, aimed to advance lime-plant engineering. Through this service Mr. Tayler seeks to stimulate higher quality, more intensive use of equipment for increased plant output, and higher thermal and mechanical efficiency of existing plants.

J. L. Sturges, former mechanical-goods salesman for the company at Jacksonville, has assumed his new duties as southern district manager of mechanical-goods sales for the Goodyear Tire & Rubber Company with offices at Atlanta. He succeeds E. A. Filley, who resigned to become general manager of the Manufacturers Rubber Supply Company, Goodyear mechanical-rubber-goods distributor for the Akron area.

Clarence L. Seaman has been appointed district manager of the Cleveland Rock Drill Company with headquarters in Berkeley, California. The company has also opened an office with service and supplies at Wallace, Idaho, Clarence F. Zeuch, mining engineer, being in charge.

Carl A. Nulty, assistant sales manager of the Ash Grove Lime & Portland Cement Company at Omaha has been promoted to sales manager. He succeeds the late J. A. Rockwell who died last April.

R. E. Weaver and Walter E. Spatz have started producing concrete blocks and Dunbrik at a new plant in Lincoln, Illinois. The concern is known as the Lincoln Concrete Products Company.

William P. Jones and Daniel Shea have formed the Jones Sand Company with headquarters at 2914 East Valley Boulevard in El Monte, California.

Robert O. Jones, mining engineer with the Westvaco Chlorine Products Corporation, Gustine, California, has been transferred to Battle Mountain, Nevada.

Harry Woolever, 78, retired president of the Coplay Cement Company, of Coplay, Pennsylvania, died July 6 at his summer home in Ocean City, New Jersey. A native of Allentown, he had resided 54 years in Philadelphia. For a half century he was a director of the Coplay firm, which he headed for several years prior to his retirement.

David H. Savage, 52, general superintendent of the Oklahoma plants of the Dolese Brothers Company of Chicago, died recently of a heart ailment at his home in Oklahoma City.

JOHN L. JACKSON, 84, head of the Jackson & Church Company of Saginaw, Michigan, passed away June 29 at his home in Saginaw after a long illness. One of Michigan's pioneer industrialists, he had long been engaged in the manufacture of sand-lime-brick machinery, automotive parts and other equipment. A native of Saginaw County, he is survived by the widow and one daughter.

WALTER "PAT" ZIEGLER, manager of the Standard Concrete Products Company, York, Pennsylvania died suddenly a few weeks ago. He had long been one of the leaders in the industry and was widely known and admired.

JOSEPH L. BAKER, 85, a founder of the Baker Ice Machine Company and the United States Gypsum Company, died June 27, at Omaha.

SIMON M. BILLITER, 64, owner of the Billiter Ready Mixed Concrete Company of Covington, Kentucky, died recently after a brief illness.

HARRY T. SMITH, traffic manager of the Worthington Pump & Machinery Corporation, died July 3. He was associated with the company for 54 years, having started with the old Henry R. Worthington Hydraulic Works, then located in Brooklyn.

LABOR DECISIONS

Parties

National Licorice Company v. National Labor Relations Board, decided by the U. S. Supreme Court, March 4, 1940; reported at 60 S. Ct. 569. The principal question for decision in this case was the authority of the National Labor Relations Board to make an order forbidding an employer to give effect to a contract with his employees, without making the employees parties to the proceeding. According to the findings, the employer refused to recognize a union which had applications from a majority of the employees, as collective bargaining agent, and, instead, had made a contract, through a committee organized for the purpose, with its employees. Under the contract the signing employees relinquished the right to strike and the right to demand a closed shop or signed

PAGE TWO-ENGINE DIESEL-POWERED WALKING DRAGLINE

One engine for loading and hoisting
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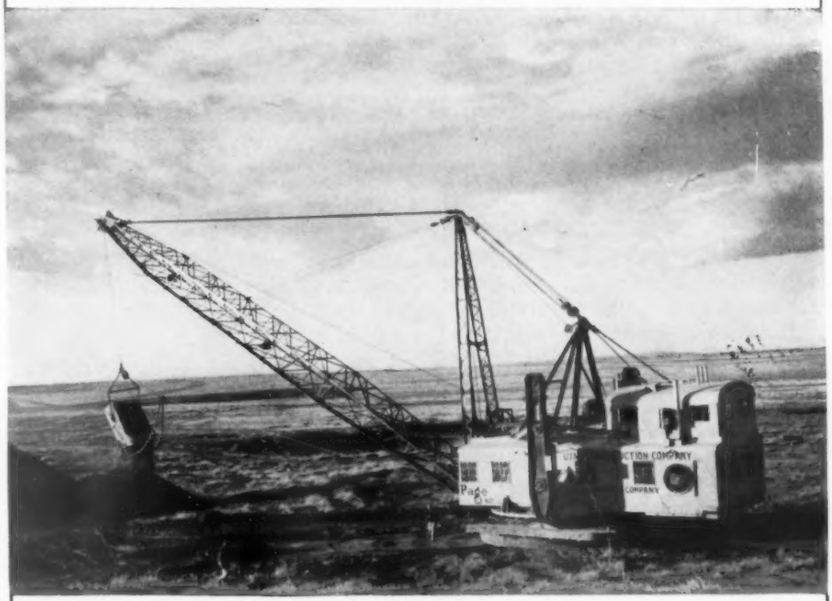

On canal work near Tucumcari, New Mexico, Utah Construction Company and Griffith Company use this Page Walker, powered by two Page horizontal Diesels, one mounted above the other. A heavy-duty 6½-cubic-yard Page Bucket is used on a 110-foot boom.

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agreement with any union. The board held that the employer had engaged in unfair labor practices and ordered it not to give effect to the contract.

"Ordinarily where the rights involved in litigation arise upon a contract, courts refuse to adjudicate the rights of some of the parties to the contract if others are not before it." But the proceeding authorized to be taken by the board under the National Labor Relations Act "is not for the adjudication of private rights . . . The board asserts a public right vested in it as a public body, charged in the public interest with the duty of preventing unfair labor practices. The public right and the duty extend not only to the prevention of unfair labor practices by the employer in the future, but to the prevention of his enjoyment of any advantage which he has gained by violation of the act, whether it be a company union or an unlawful contract with employees, as the means of defeating the statutory policy and purpose. Obviously employers can not set at naught the National Labor Relations Act by inducing their workmen to agree not to demand performance of the duties which it imposes or by insisting more than in a private litigation, that the employer's obedience to the act cannot be compelled in the absence of the workers who have thus renounced their rights." The order, modified in certain respects, is affirmed.

Labor Day

National Labor Relations Board v. Good Coal Company, decided by the U. S. Circuit Court of Appeals, Sixth Circuit, March 8, 1940; reported at 110 Fed. (2d) 501.

The National Labor Relations Board petitioned the court for enforcement of its order directing the coal company here involved to cease and desist from discouraging membership in and refusing to bargain with a union of its employees, and from recognizing an "inside" union dominated by the company, and to reinstate with back pay a group of employees found to have been discharged for union activities. The court finds the order supported by substantial evidence and orders its enforcement.

Most of the employees ordered reinstated were union members who had laid off in accordance with a union resolution to attend a union celebration of Labor Day on September 6, 1937. The company posted a notice discharging all employees who did not report for work that day. Notwithstanding the company's claim that the sole reason for the discharge of the men was that they failed to work on Labor Day, the board concluded that the purported discharge resulted from a labor dispute and that in consequence these miners retained their status as employees for the protective purposes of the National Labor Relations Act. This finding, says the court, was undoubtedly correct. "Monday, September 6, 1937, was a legal public holiday celebrated and known as 'Labor's Holiday' (Title 5, Chapter 1, Section 87, U. S. Code, 5 U.S.C.A. Section 87) and the question whether the miners should work on that day clearly involved a controversy concerning the terms, tenure or conditions of employment" (Sec. 2(9) of the Act, 29 U.S.C.A. Section 152(9)).

Agreements

National Labor Relations Board v. Highland Park Manufacturing Company, decided by the U. S. Circuit Court of Appeals, Fourth Circuit, March 11, 1940; reported at 110 Fed. (2d) 632.

The National Labor Relations Board ordered the respondent company to cease and desist from refusing to bargain collectively with a labor union representing its employees and from interfering with its employees in the exercise of the rights guaranteed them by Section 7 of the National Labor Relations Act; upon request by the union, to bargain with it as the exclusive representative of the employees; and to embody in a signed agreement any matters upon which an understanding might be reached.

The court agrees with the board that the company's conduct, as shown by substantial evidence, amounted to a refusal to bargain collectively with the union within the meaning of the National Labor Relations Act. "The requirement to bargain collectively is not satisfied by mere discussion of grievances with employee's representatives. It contemplates the making of agreements between employer and employee which will serve as a working basis for the carrying out of the relationship. The act, it is true, does not require that the parties agree; but it does require that they negotiate in good faith with the view of reaching an agreement if possible; and mere discussion with the representatives of employees, with a fixed resolve on the part of the employer not to enter into any agreement with them, even as to matters as to which there is no disagreement, does not satisfy its provisions. 'The act contemplates the making of contracts with labor organizations. That is the manifest objective in providing for collective bargaining.'"

The order of the board, consequently, will be enforced.

Equivalent Employment

Mooresville Cotton Mills v. National Labor Relations Board, decided by the U. S. Circuit Court of Appeals, Fourth Circuit, March 11, 1940; reported at 110 Fed. (2d) 179.

In an earlier action in this case the court held that the power of the National Labor Relations Board to require the reinstatement of employees with back pay did not extend to workers who had got other equivalent employment, since they no longer met the definition of "employee" contained in Section 2(3) of the act (94 Fed. (2d) 61; 97 Fed. (2d) 959). Subsequently the board held a hearing and determined that the workmen here involved had not obtained any employment which was regular and substantionally equivalent to their former positions. That finding is challenged in this action before the appellate court.

The court upholds the board in its contention that "the equivalence of the new to the old employment should be tested in the light of all the factors which would be considered by a reasonable person in the position of the worker, including the inconvenience or hardship involved in changing his place of residence," rather than being confined to "the elements which enter into the relationship of employer and employee"; and that "the equivalence of the new employment should be determined by comparing it with what the worker would have had but for the unlawful discrimination against him, and therefore that conditions in the plant subsequent to the cessation of the work, be they better or worse, should be considered in making the decision" rather than simply the old job, as the worker left it. On the basis of these principles and a review of the facts the determination of the board is upheld.

Constitutional Questions

United States v. Walters Lumber Company et al., decided by the U. S. District Court, Southern District of Florida, Jacksonville Division, March 13, 1940; reported at 32 Fed. Supp. 65.

The defendants were charged by indictment with various offenses under the Fair Labor Standards Act of 1938, and challenged the constitutional validity of that act. The principal contentions were that the indictments did not charge that the defendants are engaged in interstate commerce; that the act deprives defendants of their "liberty" of contract without due process of law; and that regulation of wages and hours is not among the powers granted to the congress. All these contentions were decided against the defendants and the act was held valid.

The criterion concerning interstate commerce is held to be "not whether defendants' activities are confined wholly within state lines, but whether or not such activities, though local in character when isolated, bear such a close and substantial relation to interstate commerce that injurious practices therein will burden, affect, injure or obstruct interstate commerce."

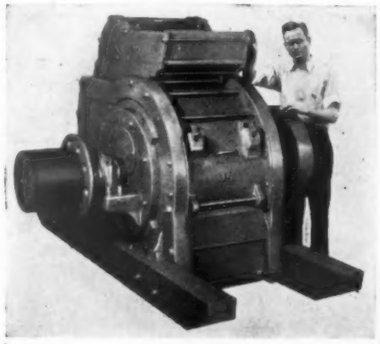
As to the other objections, the court quotes from the Supreme Court's decision in *West Coast Hotel Company v. Parrish,* 300 U. S. 379, 57 S. Ct. 578, 81 L. Ed. 703, 108 A. L. R. 1330, that "liberty under the constitution . . . implies the absence of arbitrary restraint, not immunity from reasonable regulations and prohibitions imposed in the interests of the community. . . . In dealing with the relation of employer and employed, the legislature has necessarily a wide field of discretion in order that there may be suitable protection of health and safety, and that peace and good order may be promoted through regulations designed to insure wholesome conditions of work and freedom from oppression."

Check-Off

National Labor Relations Board v. J. Greenebaum Tanning Company, decided by the U. S. Circuit Court of Appeals, Seventh Circuit, March 22, 1940; reported at 110 Fed. (2d) 984.

The respondent company was ordered by the National Labor Relations Board to withdraw recognition from an association of its employes as a bargaining agent for them, because of a finding that the company had dominated and interfered with its formation and administration; to disestablish the association; to offer reinstatement with back pay to three employees against whom it had discriminated; to reimburse all employees for any dues which the company had deducted from their earnings on behalf of the association; and to post appropriate notices.

For the most part the board's order is found by the appellate court to be founded on substantial evidence and to be within the authority conferred upon the board; that there was support for the inference of fact, which the board drew, that the continued recognition of the association by the respondent company would perpetuate indefinitely the company's influence in the administration of the association's affairs and thereby deprive the em-



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ployees of their full degree of independence and collective bargaining which the National Labor Relations Act guarantees.

However, the court refuses to enforce that part of the board's order which required the company to reimburse employees for dues checked off to the association by the company. Such a requirement could be justified under the act only on the ground that it constituted affirmative relief which would effectuate the policy of the act. The facts, says the court, "do not justify an inference that the enforcement of the reimburesment order will contribute to the effectuation of the policy of the act; and we are of the opinion . . . that the result of its enforcement will be merely to discourage the check-off practice which, at the most, is merely incidental to an unfair labor practice, and which must lose all significance with the termination of the unfair labor practice by a cease-and-desist order."

Injunction

Domanick et al. v. Triboro Coach Corporation et al., decided by the New York Supreme Court, Special Term, New York County, March 25, 1940; reported at 18 N. Y. S. (2d) 960.

In anticipation of an election ordered by the New York State Labor Relations Board to determine the collective-bargaining agency for the defendant company's employees, the defendant concluded a contract with one of two contending unions by the terms of which the employees were required to join that union or be discharged. At the election the opposing union was designated by the employees as their exclusive bargaining agency. A complaint was issued against the defendants by the State Labor Relations Board with respect to the unfair labor practice alleged to be involved in the contract made, and more than six months would be required for a determination of the issue by the board. In the interim, unless relief were granted by the court, the employees would either have to lose their jobs or forfeit their right to collective bargaining by representatives of their own choice by joining the contracting union. The employees in this action, therefore, asked that the court stay the company and the contracting union from requiring the employees, as a condition of their employment, to become members of that union, pending the proceeding before the Labor Relations Board.

The defendants contended that, under the New York State Labor Relations Act, Labor Law, Section 700 *et seq.,* exclusive authority to protect the employees' right to collective bargaining is vested in the Labor Relations Board and that the court is without authority to restrain unfair labor practices except on review of final orders of the board. The court rejects that contention, holding that, while there can be no doubt that the authority of the Labor Board to deal with unfair labor practices is exclusive and that the court is without jurisdiction to interfere with the action of the board or to review any of its intermediate orders, this does not mean that the court is without power to act in aid of a proceeding before the board for the purpose of assuring the effectiveness of its ultimate decree. "The rights of the plaintiffs might be lost through sheer lapse of time and the statute creating these rights could be rendered nugatory by events occurring while the investigation of the labor board is being carried on.

The right of employees to collective bargaining by representatives of their own choosing is held to be a right of property, and an injunction may be issued to protect that right against irreparable injury.

Interference

National Labor Relations Board v. Goshen Rubber & Manufacturing Company, decided by the U. S. Circuit Court of Appeals, Seventh Circuit, February 24, 1940; reported at 110 Fed. (2d) 432.

This case came into court on a petition of the National Labor Relations Board for enforcement of an order directing the respondent company to cease and desist from interfering with, restraining or coercing its employees in the exercise of rights guaranteed them by the National Labor Relations Act and to reinstate with back pay certain employees held to have been discharged for union activities.

A review of the evidence and "all of the reasonable inferences drawn therefrom, particularly the favored treatment accorded to employees circulating petitions for an inside organization during working hours, and the encouragement given by respondent's general manager to enlist and to bring into the plant the American Federation of Labor, we [the court] are of the opinion that there was sufficient evidence to establish a reasonable basis for the conclusion of the board that respondent had discouraged activity in behalf of the United and interfered with the rights of self-organization on the part of its employees, and that respondent was guilty of engaging in unfair labor practices." That portion of the order is affirmed.

However, the court does not find

substantial evidence that the discharge of the employees complained of was discriminatory or due to union activities, but that these discharges were for violation of company rules, inefficiency and causing disturbances. The portion of the order requiring reinstatement of those employees with back pay is stricken out.

Interstate Commerce

National Labor Relations Board v. Sunshine Mining Company, decided by the U. S. Circuit Court of Appeals, Ninth Circuit, April 3, 1940; reported at 110 Fed. (2d) 780.

The respondent company sells its entire output of minerals within the state where they are mined to a sales company which distributes them in interstate commerce; and also worked out an arrangement whereby its materials were shipped into the state and purchased in the state. It consequently relied on, and in this court action insisted on, its opinion that its operations were not subject to the National Labor Relations Act and that the National Labor Relations Board had no jurisdiction over it. The court rules against that contention. The purchasing arrangement, it finds, does not destroy the effect of the transactions on interstate commerce, and the arrangement between the producing company and the sales company as to title and the incidents of ownership does not change the essential fact that the transactions between the two corporations together constitute a direct and continuous flow of commerce across state lines to the mint and market.

"That a labor dispute which would shut down the vast mining operations of respondent and suspend all its business relations, as shown by the evidence, would have a very noticeable effect on interstate commerce, hardly requires support from the citation of authority. It is not necessary to show actual disruption of commerce where prevention is the purpose of the act. That a strike in respondent's mine would result in interference with and injury to this commerce is evident, and 'it can not be maintained that the exertion of Federal power must await the disruption of that commerce.'"

The National Labor Relations Board alleged that the respondent had interfered with, restrained, and coerced its employees in the exercise of their rights guaranteed in Section 7 of the National Labor Relations Act by directing a campaign of propaganda, threats and terrorization against the International Union of Mine, Mill and Smelter Workers (affiliated with the C.I.O.), and by utilizing the device of a company-sponsored petition and election for the purpose of destroying the union; that it had refused to bargain with the union although the union was at the time the representative of a majority of the employees in the appropriate unit for bargaining purposes; that by reason of this course of conduct a strike was called by the union; that respondent discharged and refused to reinstate over two hundred employees because they had engaged in concerted activities through the union for the purposes of collective bargaining and other mutual aid and protection; that respondent formed, dominated and contributed support to a labor organization known as the Big Creek Industrial Union; and that by reason of these acts, the company had violated Section 8(1), (2), (3) and (5) of the National Labor Relations Act.

The board, upon appropriate findings, ordered the respondent to cease and desist from: (a) discouraging membership in the union by discrimination in regard to hire and tenure of employment; (b) in any manner dominating or interfering with the administration of the Big Creek union or with any other labor organization of its employees or contributing support thereto; (c) refusing to bargain collectively with the union; and (d) in any other manner interfering with, restraining or coercing its employees in the exercise of the rights guaranteed by Section 7. As affirmative action the board directed the company to offer reinstatement with back pay to the employees who went on strike; to withdraw all recognition from and disestablish the Big Creek union as representative of its employees for collective bargaining; to bargain collectively with the union, on request, as exclusive representative of all employees in the appropriate unit and, if an understanding is reached, to embody such understanding in a written signed agreement "for a definite term to be agreed upon."

Upon a review of the evidence of the facts, the court orders enforcement of the order, modified by eliminating (at the request and with the consent of the board) the words quoted above.

Union Activities

Century Building Company, Inc., v. Wisconsin Employment Relations Board et al. decided by the Supreme Court of Wisconsin, April 9, 1940; reported at 291 N. W. 305.

The Wisconsin Employment Relations Board found the appellant company guilty of unfair labor practices in discharging three charwomen for union

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activities, and ordered it to desist from interfering with employees' collective bargaining and to reinstate the discharged employees with back pay.

The company sought to introduce additional evidence to show that the women were not members of the union concerned. The court holds, however, that such evidence would be immaterial, since an employee need not be a union member to be discharged for "union activities." "When an employer dismisses an employee for union activities or discriminates with respect to his tenure for this reason, it is of no consequence that the discharged employee is not actually a member of the union. He might be opposed to unions and steadfast in his refusal to have anything to do with them, but if his employer supposes him to be a member of the union or to be engaged in organizational activities and dismisses him on that account he engages in an unfair labor practice under the act."

The evidence is held to sustain the order of the board, and it is affirmed.

Written Agreement

H. J. Heinz Company v. National Labor Relations Board, decided by the U. S. Circuit Court of Appeals, Sixth Circuit, April 3, 1940; reported at 110 Fed. (2d) 843.

This case reached the Court of Appeals on a petition by the Heinz company to review and set aside an order of the National Labor Relations Board which directed the company to cease and desist from dominating or interfering with the administration of an inside union, refusing to bargain collectively with the outside union found to represent a majority of the employees, and interfering with the rights of its employees guaranteed in Section 7 of the National Labor Relations Act; and also requiring the company to disestablish the inside union, bargain collectively with the outside union upon request, embody in written form any understanding reached, and post the usual notices of compliance. A review of the evidence indicates to the court that the board's findings were supported by the facts, and the order will be enforced.

Concerning the order that any understanding reached be embodied in a written signed agreement, the court follows the reasoning of the appellate courts in the second and fourth circuits, which had previously held that a refusal to embody an understanding, reached as a result of collective bargaining pursuant to the act, in a written agreement was a violation of the act, and disagreees with the Seventh Circuit, where a similar order was rejected.

Even if the view of the Seventh Circuit, that no written agreement is required by the act under any circumstances, be accepted, "it does not follow," says the court, "that the board's order is invalid. We are of the opinion that the order is more obviously justified by Section 10(c), which requires the board, when it has found an employer guilty of an unfair labor practice, to serve an order 'requiring such person to cease and desist from such unfair labor practice, and to take such affirmative action . . . as will effectuate the policies of this chapter.'"

Picketing

Thornhill v. State of Alabama, decided by the U. S. Supreme Court, April 22, 1940; reported at 60 S. Ct. 736.

The appellant was convicted of "loitering and picketing," in violation of Section 3448 of the Code of Alabama, and the conviction was affirmed by the Alabama Supreme Court. The appellant urged, however, that Section 3448 is unconstitutional, denying the right of free speech, and the Federal Supreme Court sustains that contention and reverses the decision.

The Federal court finds that Section 3448 has been applied by the state court to peaceful picketing by a single individual, and that "as thus authoritatively construed and applied leaves room for no exceptions based upon either the number of persons engaged in the proscribed activity, the peaceful character of their demeanor, the nature of their dispute with an employer, or the restrained character and the accuracy of the terminology used in notifying the public of the facts of the dispute."

In holding the statute unconstitutional, the Supreme Court said that "free discussion concerning the conditions in industry and the causes of labor disputes appears to us indispensable to the effective and intelligent use of the processes of popular government to shape the destiny of modern industrial society. The issues raised by regulations . . . infringing upon the right of employees effectively to inform the public of the facts of a labor dispute are part of this larger problem."

TRADE NOTES

The C. O. Bartlett & Snow Company, Cleveland, has announced the appointment of C. O. Bartlett as district manager in the Detroit territory. Mr. Bartlett is the son of the founder and organizer of the company.

After an interval of several years since its last issue, *The P&H Crowd*, a magazine for excavator operators, has made its reappearance. The magazine is a bi-monthly sponsored by the Harnischfeger Corporation of Milwaukee, and is circulated to operators all over the world.

TRAFFIC NEWS DIGEST

Interstate Commerce Commission

Granite Rates.—Examiner Burton Fuller in No. 28286, granite, Vermont to trunk line and New England points, has recommended a definite relationship between rates on granite by railroad and by truck. He said the commission should find that carload rates on polished and carved granite were and for the future would be unreasonably high to the extent that they exceeded or might exceed column 27.5, minimum 36,000 pounds, and that the less-carload rates on granite were unreasonably low to the extent that they were or might be less than column 45, here destination delivery was included, with rates 7 cents lower where they were station rates. Station rates meaning destination delivery was not included. It was further stated that rates on granite by common-carrier motor vehicle, in quantities of less than 10,000 pounds, were, and for the future would be, unreasonably low to the extent that they reflected differentials of less than 5 and 12 cents over the less-carload destination delivery and station rates, respectively, with rates by truck, in quantities of 10,000 pounds and more, made 5 cents under the rates by truck for lesser quantities.

Chalk Whiting Case.— Arguments as to rates on chalk whiting and on finely-ground limestone, also called limestone whiting or whiting substitute, were made June 14 before the entire commission in No. 27921. Recommendations made by Examiner Mohundro furnished the grounds on which the arguments were based. Examiner Mohundro recommended that the rates be found not unreasonable in the past but unreasonable for the future in official territory to the extent that they might exceed 20 per cent, of first class.

Time for discussion of the cases was assigned to Daniel De Brier for the New Jersey commission, George A. Duffy for the complainant, W. F. Zearfaus for the defendants, and W. W. Collin for the National Gypsum Company.

It was argued by Mr. Duffy that it was the continuing duty of the commission to see to it that rates were reasonable and that such a finding as recommended by the examiner would deprive his client of the reparation to which it was entitled. The railroads contended that the rates established by them should be left on the level of 25 per cent. of first class. Mr. De Brier denied that the commission had ground for condemning the rates in New Jersey, as proposed by the examiner.

Mr. Collin of the National Gypsum Company argued against a finding of undue prejudice for the reason that such a finding would be taken by the railroads as ground for raising the rates in low spots instead of equalizing them, the object of the proposed report, on a lower level. It was argued by Mr. Zearfaus that two different commodities were under consideration in this case and that the railroads were warranted in maintaining higher rates on chalk whiting than on ground limestone. He stated that the complainant had lost business so far as linoleun makers were concerned because the linoleum industry found ground limestone cheaper as a filler than chalk whiting, and not on account of rates, as had been contended.

Legislation.— Argument has been postponed until the fall term of the federal district court in the District of Columbia in the suit brought by the government against the railroads charging violation of the Sherman anti-trust act because of adoption of resolutions opposing coöperative arrangements with trucks. The case was originally scheduled for June 27, but it was impossible for the court to hear the case on that day and the matter was postponed until fall. No continuance was asked by the railroads. Argument was to have been made on the railroads' motion to dismiss on the ground that the case had become moot by reason of the rescinding of the offending resolutions by the board of directors of the Association of American Railroads and approval of that action by the carrier defendants.

Motor Freight-Rate Investigation.— The commission has been asked by the Central States Motor Freight Bureau, Inc., on its own motion to institute an investigation into minimum charges, rules, regulations, and practices applying on local and joint less-truckload, less-carload, and less-than-volume shipments of freight moving via motor and rail carriers within Central Freight Association territory. It was contended by the bureau that the present published minimum charges of both motor and rail carriers did not return sufficient revenue to cover the cost of the service. It was also stated that damage had been done to both types of transportation by ill-advised non-compensatory schedules placed in effect by rail carriers. The bureau also pointed out that the motor rates could be raised

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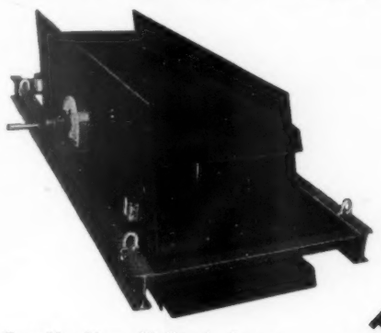

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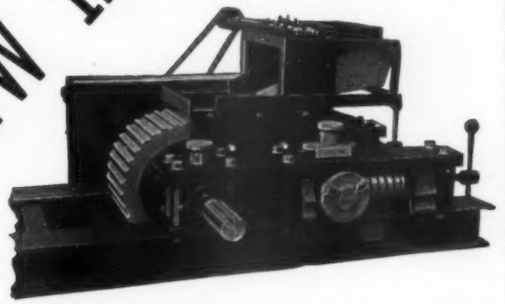

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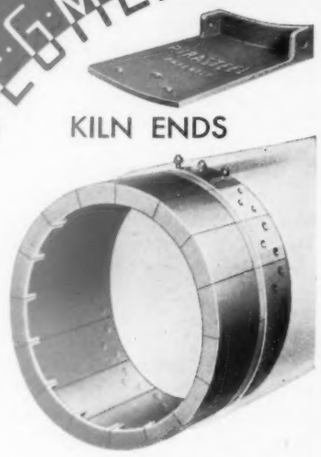

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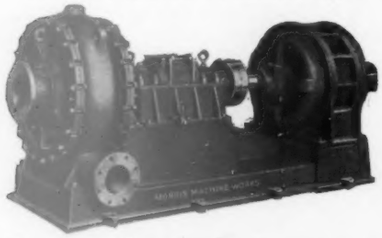

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Motor Proposed Reports

Indiana, Chesterton.—MC 101269, Charles Lorenz and Robert Lorenz doing business as Charles Lorenz & Son, common-carrier application. Joint board 21. Served June 8. Certificate proposed. Slag and cinders from steel mills, in South Chicago, flagstone and flagging from Joliet, crushed stone, screenings, and limestone from Thornton, and coal from Wilmington, all in Illinois, to points in Lake, LaPorte, and Porter counties, Indiana, and clay from Chesterton, Indiana, to Chicago, Illinois, over irregular routes.

Indiana, South Bend.—MC 96041, Richard Ort, common-carrier application. Joint board 23. Served June 21. Certificate proposed. Sand and gravel from South Bend, Indiana, to points in Berrien County, Michigan, over irregular routes, with no transportation for compensation on return.

Indiana, South Bend.—MC 96040, John Clair Geist, common-carrier application. Joint board 23. Served June 27. Certificate recommended. Sand and gravel from South Bend, Indiana, to points in Berrien County, Michigan, over irregular routes, with no transportation for compensation on return.

Kansas, Edwardsville.—MC 36554, Sub. No. 1, Glenn Blecher, contract-carrier application. Joint board 36. Served June 8. Permit recommended. Sand, gravel, crushed rock, and cement, between points in Kansas within 15 miles of Kansas City, Kansas, on the one hand, and points in Missouri within 50 miles of Kansas City, Missouri, on the other, over irregular routes.

Missouri, Kansas City.—MC 96153, Don C. Bowman, contract-carrier application. Joint board 36. Served June 20. Permit recommended. Sand, crushed stone, cement and gravel between points in Missouri within 50 miles of Kansas City, Missouri, on the one hand, and points in Kansas within 50 miles of Kansas City, on the other, over irregular routes.

Missouri, Kansas City.—MC 96148, J. A. Roney, contract-carrier application. Joint board 36. Served June 14. Permit recommended. Sand and gravel, between Muncie, Kansas, and points in Kansas within 7 miles thereof, and Kansas City, Missouri, over irregular routes.

Missouri, Parkville.—MC 96150, Earl Millsap, contract-carrier application. Joint board 36. Served June 25. Permit recommended. Sand, crushed stone, cement and gravel, between points in Missouri within 50 miles of Kansas City, Missouri, on the one hand, and points in Kansas within 50 miles of Kansas City, on the other, over irregular routes.

North Carolina, Danbury.—MC 101486, Burke Smith, common-carrier application. Joint board 7. Served June 14. Certificate proposed. Ground agriculture limestone, in bulk, from Austinville, Virginia, over irregular routes, to points in Stokes County, North Carolina. Modified procedure.

Ohio, Rogers.—MC 62219, Sub No. 2, William Vale, extension of operations. Examiner William A. Maidens. Served June 21. Denial proposed. Clay and clay products between points in Ohio, Pennsylvania, West Virginia, and New York, over irregular routes.

Pennsylvania, Delta.—MC 86204, Leonard E. McGrady, common carrier application. Joint board 74. Served June 14. Denial for want of prosecution proposed. Sand between Aberdeen, Maryland, and points in York County, Pennsylvania, over irregular routes.

Pennsylvania, Delta.—MC 96204, Sub. No. 1 Leonard E. McGrady, extension of operation—Maryland-Pennsylvania. Joint board 74. Served June 7. Denial for want of prosecution proposed. Sand and crushed stone between Baltimore, Maryland, and points in Baltimore, Hartford, and Cecil Counties, Maryland, and in York County, Pennsylvania, over irregular routes.

Fourth-Section Applications

Docket 18516.—Filed by W. S. Curlett, requesting fourth-section relief to establish rates on ground or pulverized limestone or stone dust carloads from Narrows, Virginia, to trunk-line New England and central territories to meet carrier competition to maintain grouping and to apply over short tariff routes. Rates constructed on the basis of the short line distance formula.

Docket 18532.—Filed by J. R. Peel, requesting fourth-section relief to establish rates on carloads of crushed or ground limestone from Quincy and Krause, Illinois, to points in Arkansas, Kansas, Louisiana, Missouri, Oklahoma, and Texas to meet market competition.

Docket 18555.—Filed by R. A. Sperry, requesting fourth-section relief to establish rates on carloads of gravel road surfacing from La Grange, Missouri, to Mendon, Loraine, Fowler, Paloma, Coatsburg, Camp, Point Golden, and LaPrairie, Illinois, to meet truck and wayside-pit competition.

Sixth-Section Applications

Number 2028.—R. R. Sperry, agent. To publish rate on sand from Riverton, Indiana, to Decatur, Illinois. —I.C.C. 10814.

Number 5162.—F. D. Miller, agent. To publish reduced rates on crushed stone from Russellville, to Scottsville, Kentucky.—I.C.C. 575.

Number 5172.—F. D. Miller, agent. To publish revised rates on asphaltic sandstone, bituminous rock and coated stone from Summit, Kentucky, to Speeds, Indiana.—I.C.C. 378.

FOREIGN DEVELOPMENTS

Burned Loam Used as Lightweight Aggregate

Scarcity of natural lightweight aggregates, such as pumice and "foam" slag, in the Scandinavian countries has resulted in development of processes for making artificial lightweight aggregates from suitable kinds of loam. Such burned aggregate is designated in Scandinavian literature as "clinker" and the concrete made with it is designated as "clinker concrete."

The fundamental idea for making a light aggregate from burned loam was developed by the Danish inventor of cellular concrete, E. C. Bayer. He used with success a plastic loam from Refnas, making a highly porous clinker, but did not find sufficient interest and the practical execution of the burn was not a complete success. The Swedish engineer Lindman concerned himself with a solution of the problem and has developed, and patented, the technique of burning now used. Two factories have been built in Sweden and one in Denmark using this process.

The aggregate is burned from suitable kinds of loam at temperatures of 1,200 to 1,400 degrees C. In the separation there occurs an initial sintering and at the same time a development of gases, whereby countless small closed bubbles result in the product of the burn. The burned loam is very light and porous, without, however, being water-absorbent.

A primary pug-mill receives plastic loam and feeds it continuously to a rotary kiln fired with pulverized coal, which first dries the loam, then brings it up to the sinter-starting and bubble-forming temperature. The loam passes from the kiln to an attached cylindrical screen which separates it into the following granular sizes:

Kind	Size	Volume Weight
Nut	7-30 mm.	About 500 kg. per cu.m.
Pea	3-7 mm.	About 550 kg. per cu.m.
Grit	0-3 mm.	About 600 kg. per cu.m.
Light Pea	3-7 mm.	About 400 kg. per cu.m.

The principal constituents of the burned porous loam are silicic acid (SIO_2), and loam (Al_2O_3). The burned loam is of glass-like character and has certain hydraulic qualities, adding slightly to the hardening process. The concrete is made as is ordinary concrete in a mixer; but it must be tamped in the forms, since vibration results in separation which is furthered by the light weight of the aggregates.

For bearing building elements the concrete is made with ordinary gravel and only the coarse aggregates are replaced by burned loam. Light concrete is made exclusively by use of the various grandular sizes of the burned loam. A soft consistency of concrete is seldom used, since it impairs strength, and with very wet concrete there is danger of the light aggregate floating.

Various mixes, strengths, insulation and other qualities, and uses are discussed briefly. For outdoor use a protective coating must be applied against beating rains.—*Zement,* Vol. 29, No. 8 (February 22, 1940), pp. 91-92.

Reaction in Burning Raw Slag Material

G. Mussgnug of the Gutehoffnungshuette, Oberhausen, Rheinland, reports on the reaction procedure in the burning of Portland-cement clinker made from raw flour containing blast-furnace slag, as determined in a rotary kiln and in the laboratory kiln. He concludes as follows:

It was evident that the reaction procedure of raw flours from limestone and blast-furnace slag is about the same as in raw flours from natural raw materials. There appear greater differences only in the range of reaction. For example, the new lime combinations set in more vigorously in raw flours from natural raw materials than in raw flours from limestone and blast-furnace slag, below a temperature of 1,000 degrees C. But at temperatures above 1,000 degrees C. the conditions are in reverse. Here the raw flours containing blast-furnace slag show a more vigorous degree of reaction than raw flours from natural raw materials. Therefore the blast-furnace slag reacts with the lime from the limestone to a greater extent only at a temperature above 1,000 degrees C. From the conversion or transfer of the ferrous oxide and manganese oxide into higher stages of oxidation was derived the formation of the following compound: $4CaO \cdot Al_2O_3 \cdot Fe_2O_3$ respectively $4CaO \cdot Al_2O_3 \cdot Fe, Mn(_2O_3)$. Accordingly, the formation of the tetra-calcium-aluminate-ferrite likely occurs in the temperature zone of about 1,200 degrees C.

The following data is given concerning reaction procedure in the burning process (figures in degrees centigrade):

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From Coast to Coast in the U. S. A. as well as in other countries, SECO Screens have been steadily building an enviable reputation for the efficient sizing and grading that is so necessary in meeting today's rigid specifications on stone sizes.

SECO'S "control of motion" is proving itself in nation-wide use—year in and year out.

SCREEN EQUIPMENT CO. INC.
9 Lafayette Ave. Buffalo

402—CO_2 split from $MgCO_3$ reaches atmospheric pressure;
500—dissociation of magnesium carbonate;
up to 600—chemically fixed water split off;
600-700—start of lime combination through silicic acid and alumina;
700—start of dissociation of $CaCO_3$;
800—start of lime combination through SiO_2 and Al_2O_3 and the oxidation of the S to SO_3;
950—$CaCO_3$ completely disintegrated;
900 to 1000—maximum of free CaO;
1000—more vigorous increase in new lime compound;
1100—oxidation of FeO to Fe_2O_3 and MnO to Mn_2O_3, start of formation of silicates and aluminates more fat in lime;
1200—formation of the compound $4CaO \cdot Al_2O_3 \cdot Fe_2O_3$, respectively $4CaO \cdot Al_2O_3 \cdot Fe$, $Mn(_2O_3)$, oxidation of Mn_2O_3 to MnO_2;
1300—maximum bicalcium silicate, start of formation of $3CaO \cdot SiO_2$;
1450—synthesis or building-up reactions of lime concluded.

Zement, Vol. 29, No. 19 (May 9, 1940) pp. 233-236.

Measurements in Kiln Operation

Kurt Guthmann reviews the science of measurement with reference to some recent experiences in cement plants, including measurements in kiln and raw materials, fuel and air supply, etc. A knowledge of temperature distribution in the entire kiln is of great value for obtaining a survey of the thermic procedure in cement production. Results of recent temperature measurements on a rotary kiln are shown in a chart by H. Gygi (1937). Another chart shows the most popular type of instruments. Accurate temperature measurements and correct points of measurement are essential requirements.

The thermo-element is used most widely, and is described in detail as to installation and service. Optical measurement of temperature is then discussed; also various radiation pyrometers. A diagram is shown of a full radiation pyrometer with water cooling, and compressed-air cleaner installed in the kiln wall; the compressed air is filtered and then supplied to keep dust and flame from the objective of the pyrometer. A chart is given for temperature correction between indicated and true temperature. Color pyrometry is discussed; also measurement of waste gas temperature; also measurement of dust content in kiln and drying plant, etc.

The "Bewag" Zyklon for measurement of coarse dust is described and shown, as is the L. Martius instrument for measurement of fine dust. A critical view of methods of measurement is added. Determination of moisture content of technical gases is discussed, and a U-tube wet and dry bulb humidity meter is shown. Gas analysis is discussed and results are shown. *Zement,* Vol. 29, No. 20 (May 16, 1940), pp. 241-245; No. 21 (May 23, 1940) pp. 259-263.

NEW MACHINERY AND SUPPLIES

• Bin Gate

The improved Beaumont rotary bin gate is enjoying wide acceptance among crushed-stone operators, particularly for those storing and loading agricultural stone and other fine materials, as well as cement and lime, according to the manufacturer, the Beaumont Birch Company, Philadelphia.

The gate consists of a machined rotor fitted inside a one-piece machined body with two

One of six rotary bin gates at the York Stone & Supply Company plant.

end plates. Body flanges and end plates are machined as well. The entire unit is durable and rugged, being made of cast iron. Regularly furnished with an operating lever as illustrated, it is said to be quick acting and dust tight. It fits standard pipe flanges in 6, 8 and 10-inch diameters. The rotor opening is the same size as the pipe, insuring unrestricted flow of the material.

The rotor may be removed without disturbing the body connection to chutes, hopper or bunker. The gate can be used on any angle because of the unique rotor construction.

The Beaumont Birch Company also manufactures other types of gates for storage bin service.

• Controls

The Fuller Company has concluded an agreement with Harry S. Lee through which it has acquired exclusive licenses under the Lee patents covering automatic controls for the burning and cooling of cement clinker. Mr. Lee has retained the right to equip Lee coolers with these controls.

The automatic controls now available to users of Fuller air-quenching coolers are of three types. These include control of the

weight of secondary air delivered to the kiln from the recuperator section of the cooler; maintenance of the secondary air at a predetermined temperature, and tempering of preheated primary air to hold the air at a desired temperature.

The Lee patents included within the exclusive license agreement are Nos. 2,031,047; 2,032,135 and 2,095,446. The license does not include the Lee Process clinker cooler.

• Dust Collector

Cut-away view of the collector.

The new American cyclone dust collector is of the type generally known as the high-efficiency, long-cone cyclone, and is distinctly different from the countless varieties of large diameter short cyclones.

In operation, the dust is separated from the air stream by centrifugal force. This process is the same as the other cyclone collectors. However, due to careful proportioning of the unit, unusually high efficiencies are obtained with relatively low back pressure for the American style of cyclone. Actual collecting efficiency is within a small percentage of the results obtained with filter type collectors for average dusts; and is the same as obtained in the average wet collector on the market.

The air volume can be varied from rated capacity to a great extent without seriously affecting the efficiency; however, the back pressure would naturally vary as the square of the volume ratio. The unit can be supplied in various sizes with but slight change in performance.

Dust hoppers and supports will, of course, vary considerably according to the particular installation and may be supplied by the customer according to specifications. Dust hopper, or storage tanks, can be of any design providing they will efficiently handle the capacities of dust to be collected. Dust storage can not be permitted in the collector proper. The dust discharge must be taken care of either while collector is not operating or the hopper must be supplied with a double-stage continuous-discharge valve.

The collectors are constructed of heavy-gage metal to withstand the scouring action of the dust being collected. They are manufactured by the American Foundry Equipment Company of Mishawaka, Indiana.

• Speed Reducers

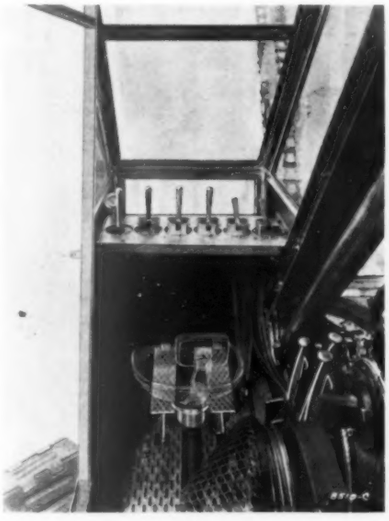
To supplement its line of speed reducers, Abart Gear & Machine Company, Chicago, has developed a new intermediate line of worm-reduction units designated Type 2⅜ A. The units in this new line are capable of handling inputs from ¼ to 2 horsepower at 1800 r.p.m. and ⅛ to 1½ horsepower at 1200 r.p.m. Ratios range from 4-5/6 to 1, to 100 to 1. The worms are made of alloy steel with hardened and ground threads. Nickel bronze is employed in the worm wheel. Shaft mountings are on full ball bearings. Gears, wheel and worm, are assembled in a semi-steel, oil tight housing with bearing supports for both worm and worm wheel machined in one casting, which insures absolute permanent alinement, eliminating the use of split bearings and shims.

Special attention has been given to the problem of lubrication. Oil seals are used on both input and output ends to eliminate all danger of oil leakage. To compensate for "build-up" of internal pressure while in operation a breather cap installed on top of gear case is provided.

• Shovel Control

The Buckeye Traction Ditcher Company, Findlay, Ohio, announces that its Models 50, 60, and 70 Buckeye Clipper shovels feature a single lever for controlling both hoist and dipper trip operations, making it unnecessary for the operator to reach for a second lever to dump the dipper load.

These operations and all other actions in the working cycle—swing, crowd, travel and boom hoist—are vacuum controlled, through the patented Mevac system developed by



Controller board in the cab.

Buckeye engineers. Six toggle levers control all operations and reduce operator fatigue.

The maker claims that, in addition to the speed provided by eliminating the lost motion of shifting long levers, the system eliminates condensation, moisture and freezing trouble and is not affected by temperature or climatic conditions.

• Grizzly-Feeder

One of the stone producer's big problems is the feed to the primary crusher. Quarry stone, when fed by gravity, has a tendency to bridge over and will not go into the crusher. Or, if the hopper is steep—all the rocks go into the crusher and choke it. Quarry dirt and small rocks also go into the crusher.

The new Pioneer traveling grizzly feeder is designed to answer these problems. Its purpose is to feed a steady stream to the primary crusher, handle the large rocks without delay, and to by-pass the dirt and small materials around the crusher.

It takes long rocks and feeds them end first into the crusher opening. It eliminates choking and prevents bridging. A clutch, with controls on the operator's platform, permits accurate control of the feed. If a stone is too large for the crusher, the feeder is stopped, the rock broken by sledge, and the feeder started with no delay to the crusher.

If there is an excess of dirt in the rock, a

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The Leahy Heavy Duty Vibrating Screen

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TRI-VIBE is the key to efficiency in *fine mesh screening*. This exclusive feature of Type "C" Leahy No-Blind Vibrating Screen gives *triple powered* vibration to the free-swinging screen jacket. Result: extra capacity, greater uniformity and increased economy. Get the facts about this modern screen.

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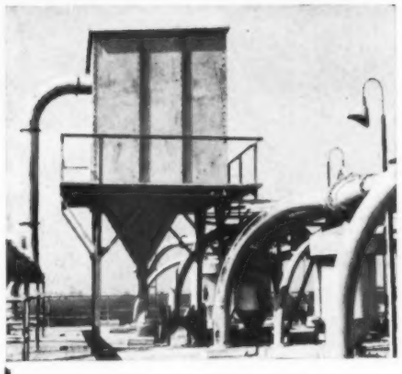

Use Modern SLY DUST FILTERS TO SOLVE YOUR DUST PROBLEM

Sly Dust Filter installations are not expensive in first cost. Many hundreds of them pay for themselves. ¶ Sly Dust Filters clean the air completely by *filtering* the dust out of it. ¶ Ask for Bulletin No. 98. It contains valuable data on how to meet a dust problem. ¶ Send details of your problem and we will gladly give you an estimate.

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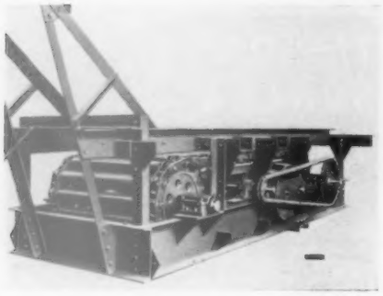


New traveling grizzly feeder.

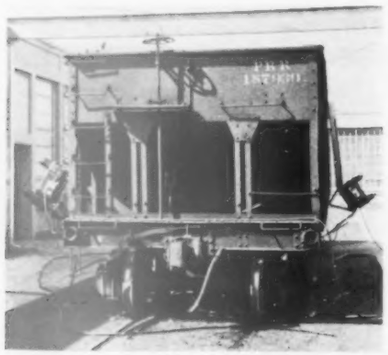
screen can be located below the feeder, the dirt rejected, and the stone delivered onto the conveyor with the product from the primary crusher.

Full information and details on the traveling grizzly feeder may be obtained from the Pioneer Engineering Works, Inc., Minneapolis.

• Vibrator

The Syntron Company, Homer City, Pennsylvania, has just developed a new, large vibrator, fitted with hooks as illustrated for attaching to hopper-bottom railroad cars to speed up the emptying process.

The vibrators are huge pulsating electromagnets striking 3600 times per minute and together with the hook weigh 950 pounds each.



Vibrators hooked onto a hopper car.

They are used in pairs, two to a car on opposite end sides.

These vibrators are also designed to be used, without the car hook, on bunkers and storage bins to promote a free-flowing discharge of material.

Each vibrator comes with a separate electrical control panel that contains a thermionic valve for changing alternating current to pulsating current, operating switches and the variable resistance for controlling the vibrator's amplitude or power.

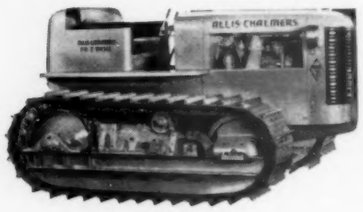
This equipment is designed for operation on 220-volt, single-phase, alternating current.

• Tractor

The announcement by the Allis-Chalmers Mfg. Co., Milwaukee, of its new 54 horsepower Model "HD 7" brings its line of 2-cycle General Motors Diesel-powered tractors up to three models. The others are the 79 horsepower "HD 10" and the 108 horsepower "HD 14".

In addition to the low fuel consumption and smoothness of operation of its full Diesel engine, the "HD 7" offers all of the other money saving features of its "big brothers."

Included in these features are the following. Because of their valuable heat conducting quality, Velvetouch bimetallic clutches and brakes last longer, requires less maintenance and speed up tractor operation. The Positive Seal truck wheels and idlers used exclusively on the A-C tractor line, require lubrication



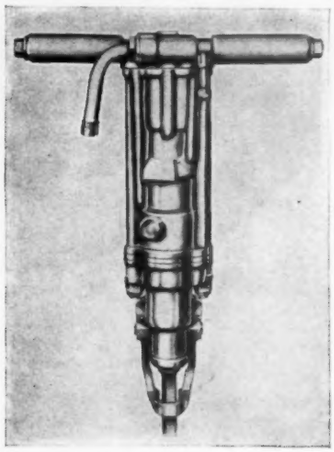
Diesel-powered tractor.

only once each 200 hours of operation. Less lubricant is used during the life of the tractor and servicing time is converted into dirt moving time. Another important feature of the "HD 7" is the new track release spring mechanism which reduces wear on tracks and prevents unnecessary strain on other tractor parts.

• Drill

The latest Sullivan drill, Class L-57, is equipped with dual valve and cushion control, two new and valuable contributions to drilling efficiency.

By means of this valve, air is controlled independently at each end of the piston; that is, the correct volume of air to give maximum striking power is admitted behind the piston, the valve is closed and the piston is propelled



New drill with "cushion control."

by expansion of the air. After the blow is delivered, air is admitted ahead of the piston to give a return stroke with strong rotating power. Premature admission of live air ahead of the piston (which reduces force of blow) is avoided.

This L-57 cushion control gives increased air efficiency, high drilling speed, low air consumption and ease of handling. This 57-pound, 24-inch machine drills easily to a depth of 14 to 16 feet. It is equipped with a shake-proof, five-position throttle handle, rubber cushioned steel puller and 4-hour capacity oil reservoir. It provides full line-pressure hole blowing and is available in dry, blower or wet types (easily interchangeable) and with various chuck sizes and rotation speeds.

• Continuous Lime Kiln

There is a definite trend in lime-burning toward making the process continuous and automatic, according to William J. Kuntz, president of the McGann Manufacturing Company, developer of the York-Kuntz continuous lime kiln. In other words, the stone will be loaded in the quarry, carried to the tops of the kilns and charged into them, with a continuous discharge of lime at the bottom. As the lime is discharged it will be screened, broken and carried to bunkers, cars or the hydrate plant as the case may be, the entire operation being continuous and automatic.

In accomplishing this the lime-plant operator will not be faced with the necessity of scrapping his present equipment. Mr. Kuntz reports that, while much of his company's efforts in this direction have been in the erection of new operations to date, the concern is now prepared to revamp existing plants, salvaging the old equipment and saving the operator at least 50 per cent. of the cost. The changes may be made without interrupting operations, thus overcoming the objections of many operators who, while willing to invest in newer, more efficient equipment, hesitate to tear down their present plants and disrupt production for weeks or months while new plants are being built.

In establishing a continuous, automatic system as described, the McGann company reports that it is guaranteeing increases in capacity of 100 per cent. and upward, depending upon the various factors involved, plus a lime-fuel ratio of 5 to 6 to 1.

Trade Literature

Positive Grip Electroline-Fiege Wire Rope Connectors. (8 pages) Electroline Company, Chicago.

Industrial Trucks — Material Handling Equipment. (loose-leaf catalog) Elwell-Parker Electric Company, Cleveland.

DuPor Respirators and Gas-Tight Goggles. (12 pages) H. S. Cover, South Bend, Indiana.

Baker Bulldozers and Gradebuilders. (folders) Baker Manufacturing Company, Springfield, Illinois.

Distribution Transformers. (16 pages) Allis-Chalmers Manufacturing Company, Milwaukee.

Trip-L-Seal Admixture for Concrete. (4 pages) Trip-L-Seal, Inc., Washington, D. C.

Denver Mineral Jigs. (16 pages) Denver Equipment Company, Denver.

Model 18 Truck Crane. (12 pages) Bay City Shovels, Inc., Bay City, Michigan.

The S-A Loader and Piler. (4 pages) Stephens-Adamson Manufacturing Company, Aurora, Illinois.

Hoists and Dump Bodies for 1½-2 Ton Trucks. (6 pages) Gar Wood Industries, Inc., Detroit.

Goodrich Mechanical Rubber Goods. (20 pages) B. E. Goodrich Company, Akron.

Rex Pumpcrete Practice. (96 pages) Chain Belt Company, Milwaukee.

The Hayward Electric Motor Bucket. (8 pages) Hayward Company, New York City.

Riggers' Hand Book. (96 pages) Broderick & Bascom Rope Company, St. Louis.

How to Cut Blasting Costs. (6 pages) R. G. LeTourneau, Inc., Peoria, Illinois.

The CONCRETE MANUFACTURER

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FIRST AGAIN!!

5 New Sizes of Rex Moto-Mixers for bigger payloads

Rex is first again—first to offer a horizontal type truck mixer designed to handle the bigger payloads demanded by progressive ready-mixed plant operators today. These NEW REX MOTO-MIXERS meet the modern trend in truck design with shorter overall lengths—faster loading—greater capacities—more convenient controls—higher efficiency—*plus all the features made famous by over a thousand Rex Moto-Mixers now in the field.*

MORE FOR YOUR MONEY

- *new larger drums for bigger payloads*
- *new drum design for faster, better mixing*
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MORE MONEY FOR YOU

- *more business with the same number of units*
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- *faster loading—faster, better mixing*
- *more big jobs—more small jobs*
- *more money in your pocket at the end of the job*

CHAIN BELT COMPANY OF MILWAUKEE

REX

See these NEW—MECHANICALLY SUPERIOR—REX MOTO-MIXERS. Ask your Rex distributor to go over them with you in detail. Have him tell you about the Rex easy time-payment plan that makes it easy for you to buy and use these new money-making REX MOTO-MIXERS. Chain Belt Company, Dept. MM-8, 1646 West Bruce Street, Milwaukee, Wisconsin.

BUY REX-MOTO MIXERS AND BE RIGHT!

The CONCRETE MANUFACTURER

August, 1940

A SPECIAL SECTION OF PIT AND QUARRY DEVOTED TO PRODUCTION MARKETING AND USES OF CONCRETE PRODUCTS AND READY-MIXED CONCRETE

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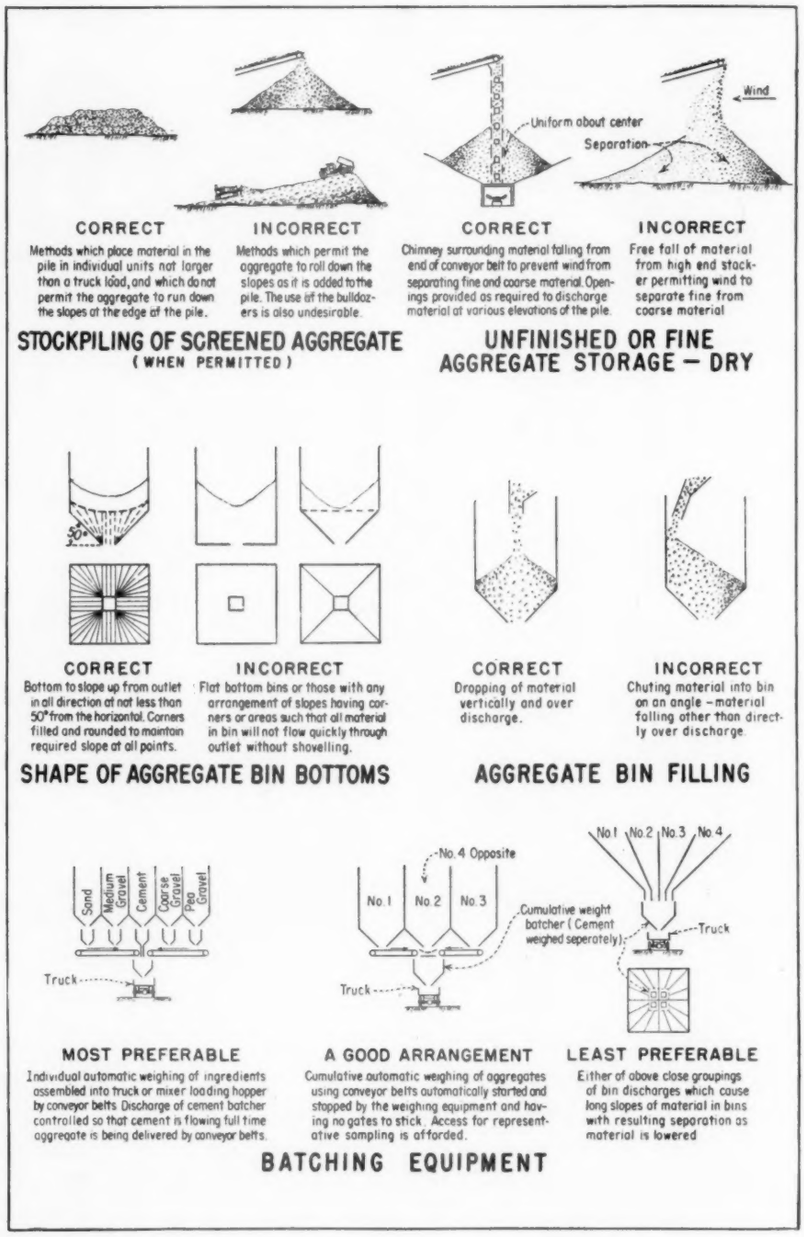

CORRECT
Methods which place material in the pile in individual units not larger than a truck load, and which do not permit the aggregate to run down the slopes at the edge of the pile.
INCORRECT
Methods which permit the aggregate to roll down the slopes as it is added to the pile. The use of the bulldozers is also undesirable.
STOCKPILING OF SCREENED AGGREGATE
(WHEN PERMITTED)
Uniform about center
Separation
Wind
CORRECT
Chimney surrounding material falling from end of conveyor belt to prevent wind from separating fine and coarse material. Openings provided as required to discharge material at various elevations of the pile.
INCORRECT
Free fall of material from high end stacker permitting wind to separate fine from coarse material
UNFINISHED OR FINE AGGREGATE STORAGE — DRY
CORRECT
Bottom to slope up from outlet in all direction at not less than 50° from the horizontal. Corners filled and rounded to maintain required slope at all points.
INCORRECT
Flat bottom bins or those with any arrangement of slopes having corners or areas such that all material in bin will not flow quickly through outlet without shovelling.
SHAPE OF AGGREGATE BIN BOTTOMS
CORRECT
Dropping of material vertically and over discharge.
INCORRECT
Chuting material into bin on an angle — material falling other than directly over discharge.
AGGREGATE BIN FILLING
Sand
Medium Gravel
Cement
Coarse Gravel
Pea Gravel
Truck
No. 4 Opposite
No. 1
No. 2
No. 3
Truck
Cumulative weight batcher (Cement weighed seperately)
No. 1
No. 2
No. 3
No. 4
Truck
MOST PREFERABLE
Individual automatic weighing of ingredients assembled into truck or mixer loading hopper by conveyor belts. Discharge of cement batcher controlled so that cement is flowing full time aggregate is being delivered by conveyor belts.
A GOOD ARRANGEMENT
Cumulative automatic weighing of aggregates using conveyor belts automatically started and stopped by the weighing equipment and having no gates to stick. Access for representative sampling is afforded.
LEAST PREFERABLE
Either of above close groupings of bin discharges which cause long slopes of material in bins with resulting separation as material is lowered
BATCHING EQUIPMENT

Graphic presentation showing correct and incorrect methods of handling aggregates in storing and batching, reproduced from "Proposed Recommended Practice for Measuring, Mixing and Placing Concrete," pages 329-351, Journal of the American Concrete Institute, February, 1940.

Cinder-Block Meeting

The seventeenth annual convention of the National Cinder Concrete Products Association will be held August 6 and 7 at Atlantic City, New Jersey, according to an announcement by Harry H. Longenecker, Philadelphia, secretary-treasurer.

Opens New Pipe Plant

The Fehr Concrete Pipe Works, of Eau Claire, Wisconsin, has started operations at its new $25,000 plant in La Crosse. Albert E. Keller, for the last 13 years a member of the city engineer's staff at La Crosse, has been named manager of the local plant.

By HARRY F. UTLEY

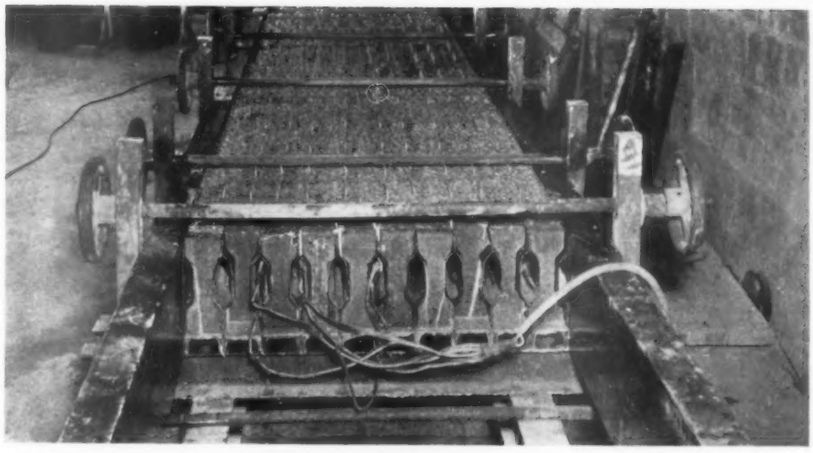
Novel Method of Using Electric Heat Doubles Output of Concrete Joists

LEAD-SHEATHED cable of the type used to heat soil in greenhouses has been used effectively through two winter seasons to hasten the curing and increase the output of concrete joists at the plant of the Columbia Concrete Products Company at Toledo.

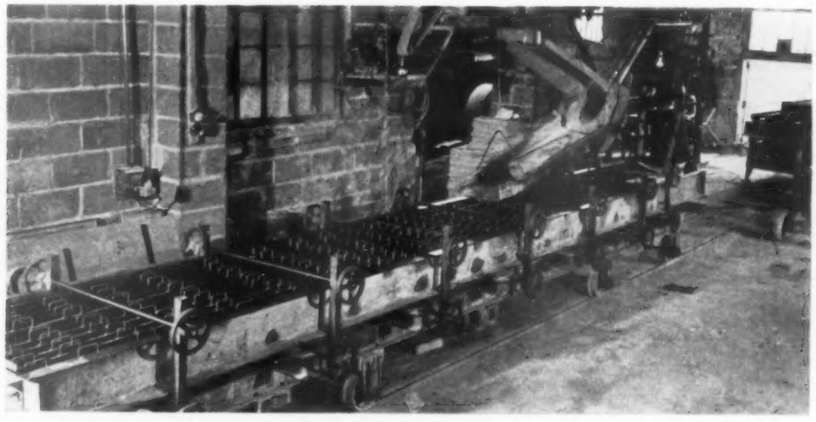
The vibrating table, built by company mechanics, makes ten 8-inch or 10-inch I-beam joists, using Kirk & Blum forms, at one time. The heating cable, wound on nine notched sheet-metal arbors, is placed in the openings between the forms. Standard practice is to pour the forms as early as possible in the morning, turn on the current for from 2 to 4 hours, strip the forms in early afternoon, and pour a second set before quitting time. Incor high-early-strength cement is used and, for a cost of 1.6 kilowatt-hours per 20-foot joist, the output of the mold has been doubled. Formerly salamanders supplied heat to accelerate curing, having been placed beneath the molds. Not only were these inefficient but they made it necessary to close the room entirely, temperature control was uncertain, and there was the labor cost of building and keeping up fires to contend with.

This stripper is the main production machine for concrete block.

The voltage used on the cable is 230; connected load is 7.2 kilowatts; heating cost by electricity a little more than three-tenths of a cent per foot of joist. The cost of the installation was only about $75, the method having been



Joist forms filled with concrete showing connections to electrical-heating cables.



Another view of the joist-vibrating table with concrete chute at right.

General Manager Joseph Nagy and a helper pouring a set of joists.

A general view of the yard and plant. Cinder-crushing building at left.

worked out by Joseph Nagy, general manager of the plant, and H. K. Burch of the Toledo Edison Company.

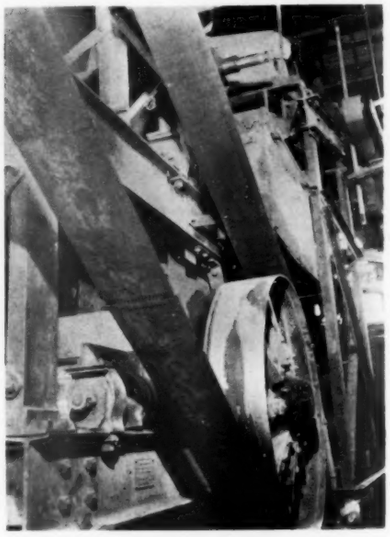
Formerly known as the Columbia Concrete Block & Supply Company, the concern occupies a 5-acre tract in northeast Toledo and is said to be the largest concrete-products manufacturer in that area.

The main production machine is a Besser Victory stripper served by a Besser 30-cubic foot mixer and skip hoist. Specials, manhole blocks, etc., are made on an Anchor Junior tamper and a Besser face-down machine, both supplied by a Stearns 12-cubic foot mixer. Concrete for the joists and other vibrated-slab products is prepared in a Jaeger 1-cubic yard mixer.

Most of the racks are mounted on flanged wheels and move into the curing rooms and out into the yard over rails while a Barrett lift-truck moves the other racks. The curing rooms have a capacity of 4,600 standard blocks. A wide variety of special items are manufactured including a special design of double-paneled block which the Sun Oil Company uses to erect its distinctive service stations in Toledo and its environs.

Although railroad facilities are at hand, aggregates and cement usually arrive by motor truck. Gravel and crushed-stone ane stored in two Neff & Fry concrete-stave silos. Cinders come from the power plant of the Toledo Edison Company, located but a few blocks away. A double-deck vibrating screen, hammermill and a 16-inch set of double rolls, all of New Holland manufacture, prepare the cinders at the Columbia plant.

The company does much of its own repair work and fabricates considerable equipment used. It has built a special vibrating table for molding roof slabs, makes its own mold-boxes, tampers, etc., for the block machines, and hard surfaces the cinder-crushing rolls by welding with a Marquette a.c. welder, to mention a few of its activities along this line.

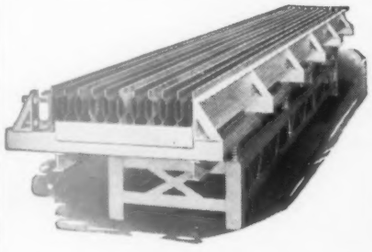


A view of the compactly-arranged screening and crushing equipment for processing cinders.

The plant was opened in 1902 by the father of Joseph and John Nagy, its present owners. While numerous additions have been made from time to time, plans are now in the making for revamping the entire operation so as to utilize the speed and economies of modern, line-production methods. Another storage silo is to be erected and the yard storage is to be roofed over to protect the finished products from the elements.

KIRK & BLUM

STEEL FORMS for CONCRETE JOISTS

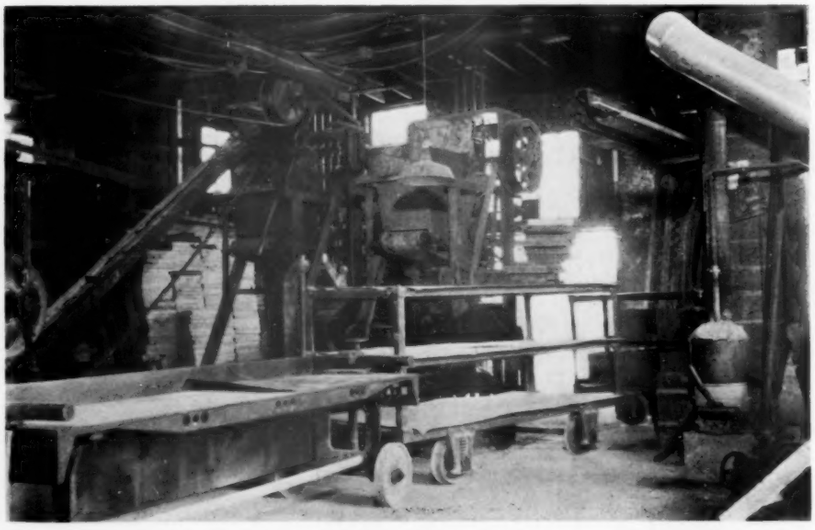


Made in Standard 20-Ft. Lengths —also in special lengths to meet individual requirements.

HEAVY DUTY VIBRATING TABLES can be furnished for this equipment.

We manufacture Sewer Forms—Curb and Gutter Forms—Steel Concrete Forms of All Kinds. Details on request. Write—no obligation.

THE KIRK & BLUM MFG. CO.
2818 Spring Grove Avenue
Cincinnati, Ohio



The two power tampers shown in the background are used for making "specials." Sills, lintels and other slabs are made on the portable vibrating table in the foreground.

George MacNeill says: "I can't make an intelligent sales talk." Nevertheless

. . . . . His Customers Are Buying 1,000,000 Bricks a Month!

WHEN C. L. Carlsen and his associates some years ago formed the Chicago Dunbrik Manufacturing Company, Inc., they put all their limited capital into a Dunbrik plant. There was no money remaining to be spent for advertising, direct or otherwise, and George W. MacNeill was given the job of disposing of the output.

"Having never sold a similar line, I found myself in a very uncomfortable position," says Mr. MacNeill. "Just how was I to accomplish results? After giving the matter careful consideration I resolved to pass the buck on to the brick. In other words I resolved to give concrete brick the supreme test, sink or swim. Here is how it was done:

"First I compiled a card file which I consider the foundation of any successful selling campaign. It included the names, addresses and telephone numbers of all architects, general contractors, and mason contractors in my territory. And I created another class of prospective buyers which I labled 'owner-builders.' The latter do not employ an architect and seldom a general contractor. In the upper right-hand corner of each card I put a capital letter that classified the prospect—'A' for architect, 'G' for general contractor, etc.

"Next I made a rough sketch of my territory and divided it into lanes four blocks wide running east to west parallel to and north of Madison Street, a total of 19 numbered routes. I arranged my cards in proper order so that my next call was always just around the corner or perhaps in the same block. I put a rubber band around each group of cards and placed them in their right order in my card-file box, with the alphabetical index in the rear. Then I went to a printer for business cards, and on the back of each I wrote the prices of the various brick with a red pencil.

"On July 6, 1938, at 8 a.m. I left the yard with 40 bricks (20 of one color and 20 of another) in the back of my car planning to make 20 calls each day. This I found to be easy as most of my prospects were either out or busy and conversation was not a part of my program when covering the ground for the first time. I left for each prospect two bricks, one of the natural gray and the other a colored unit. I always laid one brick down flat and stood the other upright on my card. If the prospect's office was in his home and no one answered the bell I left my samples and card under the mail-box in the hall.

"Right here it is important to say that, whenever possible, I wrote the prospect's name on the face of my card, thus conveying the idea that I knew him, or that perhaps he was expecting the samples. Even the prospect himself is often uncertain in this regard (he may think he knows me or he may have ordered the samples and forgotten about it), so he examines the two bricks carefully and puts my card in the top drawer of his desk with a hundred others, remembering perhaps that it was an orange-colored card. (All business cards used in this manner should be of a good distinctive color.)

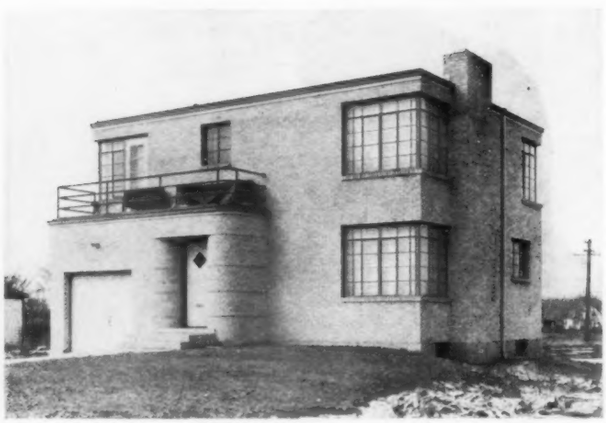
"Some days I had better luck than usual, making fewer personal contacts, and on two or three occasions I was able to cover two routes (of 20 calls each) on the same day. Before I had completely covered my territory the first time a few architects and contractors began to show up at the yard and some bought brick. The law of averages was beginning to work. The concrete brick was making its own friends and creating its own market.

"Contractors who purchased bricks for one job usually continued to use them. Owners began to choose these permanent concrete units, the bricks that did not turn white in the wall. And so, gradually, the business grew. For each new account we put a large brown envelope in the office file.

"On my successive trips over the 'routes' I do not move quite so rapidly. I look for and obtain interviews. And 'call-backs' are taking much of my time. Each day architects and contractors telephone the yard and ask that I call back and see them. I am spending my time with those who really are interested in Dunbrik. The result is more sales. However, I get back to my 'routes' whenever possible. I am still leaving each prospective buyer two brick samples and this time my card is attached to a piece of printed literature, and a list of Chicago houses built of our bricks.

"I never call on an owner unless he is building his own home, or unless the architect or contractor requests me to do so. When an architect suggests that I see his client I lay before him (the client) about six bricks of different colors and ask that he choose the color he wants. I have little trouble with owners. They like the word 'concrete.' And they like to choose—they do not like to be 'sold'!

"I know very little about brick, but I am learning. And common sense tells me that a brick that can, by sheer force of merit, make its own friends and create its own market in a hard-boiled city that has always used clay units, is a good brick. It has quality



Some of the houses built in the Chicago area using concrete bricks sold by Mr. MacNeill.

unquestioned. The manufacturers who make it and the contractors who use it are building solidly for the future. Their business will grow and prosper. And so will mine.

"Right here let me call your attention to a fact. Up to now I have not made one single attempt to sell bricks as such materials are usually sold. I have simply made it possible for builders to buy. To be perfectly honest with you I don't think I could make an intelligent sales talk on concrete brick. I can't recall that I ever have done so. But I might quote one of my customers who has built more than a dozen concrete-brick houses. He says: 'Concrete brick lasts longer and improves with the years. The colors used are the same as have been used for years in clay brick. They are sun-fast and permanent. But with concrete brick we get away from the ills common to other brick. They absorb less moisture and we do not need to water them before using. They do not turn white in the wall. They are time and money savers because they are easier to handle and easier to lay. They cut easily with the trowel. They build a better and stronger wall.'

"To-day at the plant office was typical. At 9 o'clock this morning Frank Gauley called on the phone. He had seen two of our concrete bricks in the office of some builder. 'Have you a salesman who might call on me?' he asks. The result: 8,000 bricks sold for a small home in Glenview. He was all for concrete.

"At 11:00 a.m. Mr. Binder phoned. He is the buyer for Rice & Rice, 'builders of better homes,' in Sauganash Park. They had two more foundations ready and wanted the salmon-colored brick for one and 'mingled reds' for the other.

They are regular users of our product.

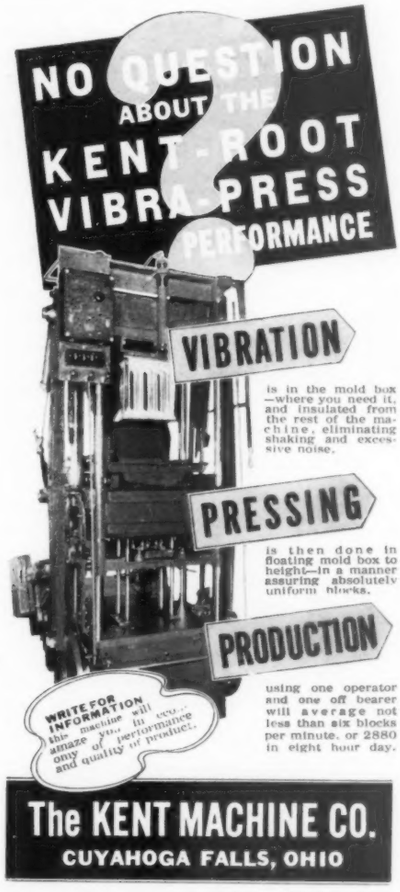
"At about 2 o'clock the 'phone rang again. This time it was Benjamin J. Olson, architect. He wanted MacNeill to come right over. I did—and returned with an order for 27,000 units to be used in a small addition to the administration building of the American Manganese Steel Company at Chicago Heights. Mr. Olson's card in my file tells me that three months previous I had left sample bricks at his office. He was not in. But the bricks apparently sold themselves.

"Concrete units—especially concrete bricks—are winning on their merit in Chicago. Every builder who uses them sells other builders just as every job sells other jobs. Dunbrik has made its own friends and created its own market. My customers here will soon be using *more than a million a month!*"

Medals for Heroes

Outstanding instances of the exercise of courage and resourcefulness by workers in the mineral and allied industries in time of emergency were recognized by the Joseph A. Holmes Safety Association at its annual meeting held in Washington, D. C., in April. Awards of 11 medals and 4 certificates of honor were made to individuals for meritorious effort in saving the lives of others. One hundred and twenty-six certificates of honor, in recognition of operation over long periods of time without fatalities or lost-time accidents or with remarkable low-accident records, were given to coal mining, metal mining, nonmetallic mining and petroleum companies, and 43 certificates were given to individual workers who had established long-time safety records.

A medal was awarded to John C. Penwell, of Martinsburg, West Virginia, for saving the life of H. R. Breslau, chief electrician, Standard Lime & Stone Company, in August, 1939. Mr. Breslau, while inspecting an electrical distribution panel, had inadvertently taken hold of two live wires and was held fast. Mr. Penwell, who had lost nearly complete use of his right arm through an industrial accident, discovered Mr. Breslau's predicament and, in a rare display of quick thinking and prompt action, used his good left arm to retrieve the only available tool, a stick of wood placed in a corner directly in front of Mr. Breslau; then with a few strokes of the stick, he disengaged the injured man. Not more than one minute elapsed between the finding of Mr. Breslau in his dangerous position and his disentanglement from the live wires. Mr. Penwell's excellent judgment and prompt action undoubtedly saved the man's life.


NO QUESTION ABOUT THE
KENT-ROOT
VIBRA-PRESS
PERFORMANCE
VIBRATION
is in the mold box —where you need it, and insulated from the rest of the machine, eliminating shaking and excessive noise.
PRESSING
is then done in floating mold box to height—in a manner assuring absolutely uniform blocks.
PRODUCTION
using one operator and one off bearer will average not less than six blocks per minute, or 2880 in eight hour day.
WRITE FOR INFORMATION
this machine will amaze you in speed, ease of operation and quality of product.

The KENT MACHINE CO.
CUYAHOGA FALLS, OHIO

QUALITY PLUS

GREATER STRENGTHS
MORE UNIFORM BRICK
WITH A
JACKSON
Concrete
Brick
Machine

Cross section showing frog type concrete brick.

NO PALLETS: The concrete is compressed so firmly that the bricks are removed by hand and piled on top of each other on flat-deck, lift-truck platforms or cars each holding 1,000 brick (this simplifies production tallies).

CHEAPER PLATFORMS: Since no pallets are used, the expensive tier type platform is done away with and only a flat deck platform is required. By setting a rack on top of these platforms, they can be used for concrete blocks. This does away with two sets of platforms where both brick and block are being manufactured.

LOW FIRST COST: Because cheaper platforms are used and no pallets are needed, the first cost is considerably lower with a Jackson brick machine installation.

LOWER OPERATING COSTS: Because no pallets are used a great deal is saved in handling and maintaining thousands of pallets as well as providing storage space for them when not in use.

HIGH PRODUCTION: Up to 14,000 brick in an eight hour day can be made on the Model "C" brick machine which has six pocket molds in the rotary table. The Model "A" brick machine, which has twelve pocket molds, produces up to 28,000 bricks a day. This is by far the fastest producing concrete brick machine on the market today.

CLEAN, SHARP-EDGED BRICK: Because the brick are picked off the top of the plungers as they are forced up through the table pocket, they retain all of their clean cut sharp edges, thus making good looking and more salable brick.

WRITE TODAY FOR ILLUSTRATED FOLDER

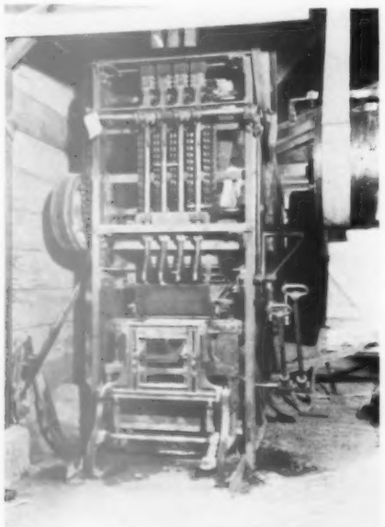
JACKSON & CHURCH CO.
SAGINAW, MICH.

Adds Brick, Block Department

The concrete-products plant of the Cass City Sand & Gravel Company.

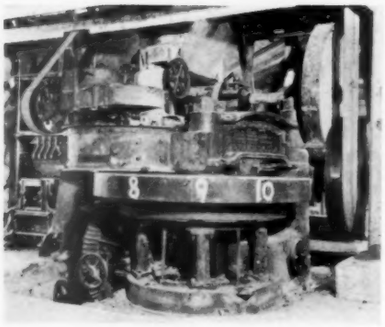
PRACTICALLY all the output of the Cass City Sand & Gravel Company's plant on the outskirts of Cass City, Michigan, goes into the building and maintenance of state highways in the "thumb" district of Michigan. As the product is specification material, considerable waste aggregate accumulates, especially in the smaller sizes. In order to develop a market for this material, E. L. Schwaderer, who heads the concern, decided recently to add a department to manufacture concrete blocks and bricks, production getting under way early in the summer of 1940.

Blocks are being made on a Miles power tamper, while a Jackson & Church Model A machine was installed to press the bricks. The brick machine is the type used for many years in manufacturing sand-lime bricks in various plants throughout the country and is ideally adapted to concrete-brick production. It is a high-capacity machine capable of turning out 28,000 bricks a day. No brick pallets are required, the units being formed under such great pressure that they may be handled and piled for curing immediately without danger of injury.



This power tamper is the production machine for concrete block.

Lift-truck and skids loaded with bricks piled without pallets.



The heavy-duty brick press is capable of turning out 28,000 units per day.

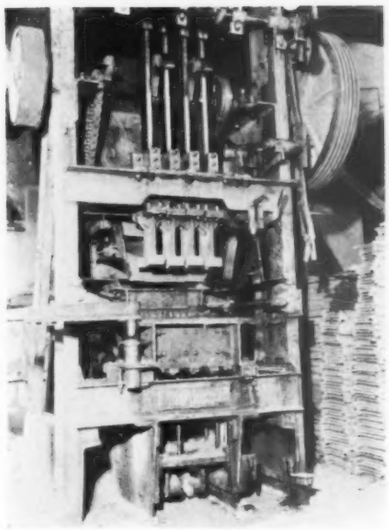
Materials are proportioned and chuted into a skip-loader which lifts them to the 15-cubic foot Blystone mixer located on a mezzanine floor over the block and brick machines. A Niagara meter measures the water. A 20-horsepower Westinghouse electric motor drives all the equipment, power being transmitted through belting and shafts. The skids on which the bricks are piled and the block racks are moved with a Barrett-Cravens lift-truck. Curing facilities are to be added later and the present frame building which houses the concrete-products machinery is to be veneered with concrete brick.

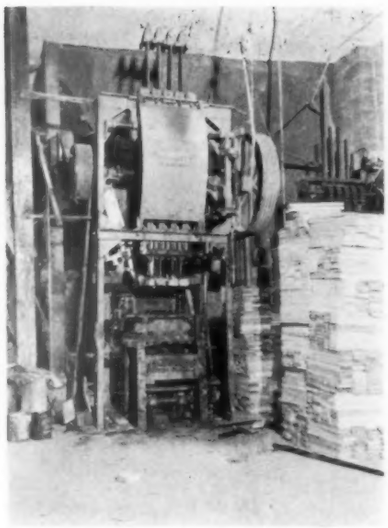
Both 8-inch and 12-inch plain and rock-faced blocks are being made on the Miles tamper. The bricks are of the popular frogged design in natural gray tone, although units in any color will be produced as the demand arises.

Detroit Operator in New Plant

A 1940 building "boom" in Detroit, particularly marked in residential construction, is accounted for the greatest use of concrete blocks in many, many years. Detroit has always been a "good" concrete-block city because of the high proportion of these units used compared with other masonry materials. Competition, however, has brought on what is almost equivalent to a price war with the result that few of the makers are realizing

Yard and new plant of the Cecil Cement Block Company.





These two tampers of identical design were installed when the new plant was erected.

much in the way of profit. Standard-size units are reported to be selling for as low as 7 cents each.

Located on Cecil Avenue for years, the Cecil Cement Block Company recently acquired a larger site on the western outskirts of the city and erected

The mixer which serves both tampers.

a new plant, designed for low-cost production, which is enabling the company to sell at prevailing prices with some margin of profit. The plant itself is of concrete-block construction.

Gravel and cement are received in motor trucks which drive up an earthen ramp behind the plant structure so that the feed to the Multiplex 18-cubic foot mixer is by gravity. Two Multiplex standard power tampers produce all the blocks, one ordinarily being used for 8-inch, the other turning out 12-inch units, for which there has been an exceptionally large demand. All the curing is done in the yard, the racks being moved with a Lewis-Shepard lift-truck. The plant has been operating 7 days a week through most of the spring and summer, according to Superintendent Stanley Stalmack.

Lift-truck which transports the racks.

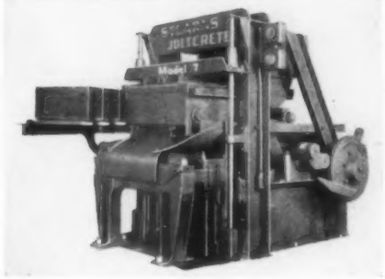
Court Holds Machinery Is Part of Freehold

Machinery and other equipment necessary to industrial plant operation become part of the freehold, are embraced in a mortgage lien if one exists and are exempt from attachment by a creditor, according to an opinion handed down at Philadelphia by State Supreme Court Justice H. Edgar Barnes in affirming the Somerset County Court's refusal to allow H. K. McClure to attach rock-crushing machinery on a Somerset county tract operated by the Atlantic Rock Co., Inc.

"All machinery in a manufacturing plant necessary for its operation as a complete going concern is part of the freehold and bound by the lien of a mortgage thereon, even if the machinery was placed in the plant after the mortgage was given," the ruling held.

The Dunlap Company of Oklahoma City is reported to be erecting a three-kiln lime plant at Sallislaw, Oklahoma. It will be served by the Kansas City Southern Railway.

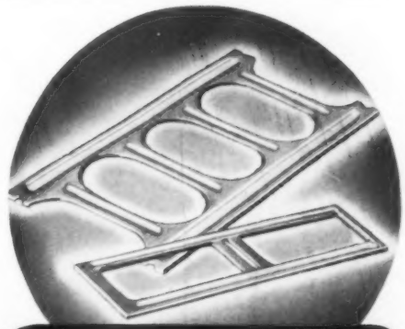
The Vibration Machine Supreme



Vibration under pressure — 7,200 blows per minute—and ruggedly built to give long life, the Joltcrete machine is the choice of the wise concrete-products operator. Produces clean-cut, high strength units in any size, and gets the most out of a bag of cement. Built in three sizes with capacities of 7 to 9 standard units per minute.

Hobbs block machines, Anchor tampers, Anchor Jr. strippers, Stearns power strippers and Joltcrete, Stearns mixers, and Cast Iron and Press Steel pallets, Straublox oscillating attachments, etc. Repair parts for: Anchor, Ideal, Universal, Stearns, Blystone mixers and many others.

ANCHOR CONCRETE MACHINERY CO.
G. M. Friel, Manager Columbus, Ohio



LESS DEAD WEIGHT

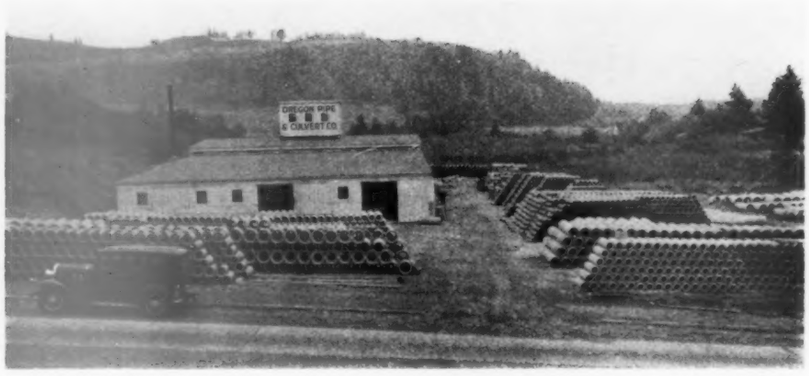
COMMERCIAL CORED STEEL PALLETS ARE LIGHTER IN WEIGHT

In one day's production of two thousand 8" blocks, the plain pallet user handles approximately 108,000 pounds more pallet weight than the cored pressed steel pallet user and 88,000 pounds more pallet weight than the cored cast iron pallet user. Or equivalent in human effort to handling two carloads of material—*every day!*

THE COMMERCIAL SHEARING AND STAMPING CO.
YOUNGSTOWN, OHIO

The CONCRETE MANUFACTURER

Oregon Metal-Pipe Fabricator Enters Concrete-Pipe Field



General view of the plant and outdoor storage.

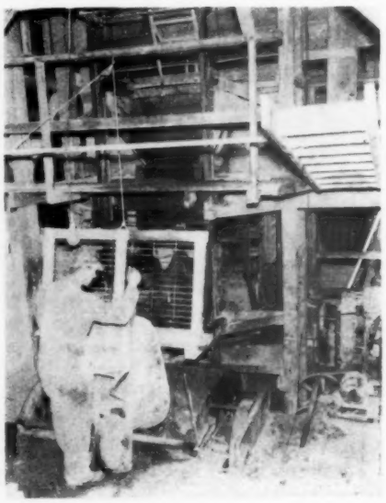
AN interesting development in the concrete-pipe manufacturing industry is the recent entry into it of a manufacturer of steel pipe. This company, the Oregon Culvert & Pipe Company, Portland, Oregon, operates in that city a large and modern plant making metal irrigation pipe, culverts, spiral-welded steel pipe, and a complete line of "Calco" automatic tide gates and irrigation gates. In 1938 it was decided to add various types of concrete pipe to this line and a plant was built for this purpose. This plant, which went into operation June 23 of that year, makes all types of sewer, culvert and irrigation pipe. Now the company is in a position to furnish any type of pipe desired.

The new concrete-pipe plant is located near a sand-and-gravel plant from which gravel and the sand for culvert pipe are obtained. Columbia River sand is used for sewer and irrigation pipe because of its more uniform gradation. Aggregates are stored in floor-level bins and are fed from wheelbarrows to the 14-cubic foot Tuerck-McKenzie mixer which is sunken in the floor. A counterweighted wire grate covering the mixer is raised only when it is being loaded. A 7-cubic foot Tuerck-McKenzie skip elevates the concrete into the pipe-machine hopper from which a special feeder with 12 mixing paddles feeds the machine, a sliding gate controlling the rate. This additional mixing insures a uniform flow of concrete into the pipe molds.

The machine is the latest type No. 2 Tuerck-McKenzie rotary tamper. Separate motors operate the tamper table, mixer and hoist through Gates V-belt drives. The feeder is driven through a clutch and chain from the tamper motor. All the electric motors, which are Lincoln waterproof machines, are controlled from a centralized switchboard near the machine and from local Cutler-Hammer safety switches.

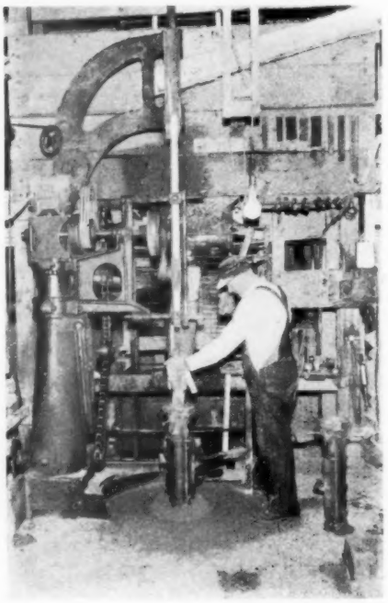
Three men operate the machine, one on the mixer, one on the machine and an off-bearer. The smaller sizes of pipe are carried in metal clips, rubber-tired lifts being used for the larger sizes. Two sets of forms for each size of pipe made are carried in stock. Enough cast-iron pallets for a day's run of each size are also carried. The capacity is from about 1,000 feet per 8-hour day of 3-, 4- and 6-inch pipe to about 50 pieces of 36-inch pipe. Curing is done with water in the summer and steam in cold weather.

The products made on this machine are culvert, sewer and irrigation pipe from 3 to 36 inches in diameter. The irrigation pipe is of the tongue-and-groove type and the others are made either tongue-and-groove or bell-and-spigot. Larger pipes are made by hand when called for. Culvert and sewer pipes over 21 inches in diameter are reinforced with Columbia Steel Company wire cages. The company is now making 10,000 feet of 12-inch and larger bell-end sewer pipe for the new Aluminum Company of America plant being built near Vancouver, Washington.



Workman charging the 14-cubic foot mixer which feeds the skip.

Irrigation pipe is gradually becoming more important in this area. A 90-day drought occurs every summer and farmers, orchardists, etc., find flood irrigation necessary for the best results.



Making a 3-inch bell-and-spigot unit on the pipe machine.

A large line of "specials" is also made, including ⅛ and ¼ bends, Y's, T's, traps, P traps, running hand-hold traps, etc. Many of these "specials" are made on the machine. The bells are made by hand but can also be made by the machine if desired. The bells and the hand traps are now being hand-tamped in special Tuerck-McKenzie molds and a 1:3 mix is used instead of the 1:4 machine mix in order to obtain sufficient strength. Another "special" made is a half-section pipe with a scalloped edge for filter drains in the bottom of sewage-disposal beds.

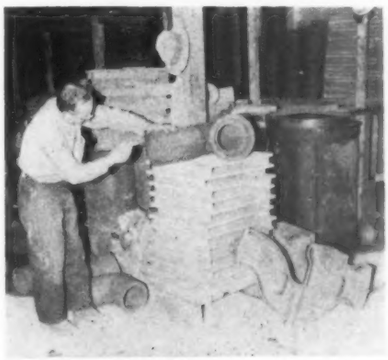
All the company's products are made to meet the city of Portland's specifications for sewer pipe, which are in line with A.S.T.M. specifications. Both hydrostatic pressure and three-point strength tests are required. These tests are made on a machine using a Black & Decker Loadometer.

The company follows the practice, common on the Pacific Coast, of laying out and installing the irrigation sys-

Superintendent Larry Cook looks over one of the special molds.

tems for which it sells the pipe. This work is done for any size job for private, municipal or other use. Most such projects secure water by pumping from creeks or rivers, which are abundant in this area. The sales force consists of five graduate engineers who are able to sell, design and supervise the installation of such a project.

Larry D. Cook is plant superintendent and E. W. Gibson is general manager of all operations.



Finishing up a "special" by hand.

Licenses 3 Producers

According to Walter A. Trepte of Stonex Industries, Miami Beach, Florida, three firms have just been licensed to produce Stonex concrete floor slabs. They are the Lane Tile & Marble Company, Birmingham; Elkan Stone-Tile Manufacturing Company, Macon, Georgia; and the DeBacco Tile & Terrazzo Company of St. Louis.

The Northwestern Magnesite Company is reported to be operating its mines and plant at Chewelah, Washington, at capacity.

War demand is said to be responsible.

JAEGER "HIGH DUMP" TRUCK MIXERS
Solve Your Placing Problems

INTO HOPPERS, BUCKETS

OVER DIRT PILES INTO THE FORMS

FASTEST LOADING, FASTEST MIXING AND FASTEST HIGH DISCHARGING TRUCK MIXER ON THE MARKET . . .

NEW DRUM SIZES BOOST PAYLOAD

Latest development by world's largest mixer manufacturer — mobile 2, 3 and 4 yd. concrete plants that cut placing costs, deliver proven higher strength concrete. One-Shot Top Loading, 2-Speed Mixing, Vacuum Controlled Discharge, many other features. GET CATALOG, PRICES, EASY TERMS.

HIGH DUMP MIXERS
2, 3, 4 Cu. Yd. Sizes. 2 Yd. Size Mounts on Short Wheelbase Ford-Type Trucks

Also STANDARD HEAVY DUTY MIXERS up to 5½ Cu. Yds. (7½ Cu. Yd. Agitators)

THE JAEGER MACHINE CO., 602 Dublin Ave., Columbus, Ohio

New Mixing Plant on Harlem River

One section of the new mixing plant of James A. Norton, Inc., in New York City, is under construction at left. The old batching plant is at right.

Your SURPLUS AGGREGATE

A SOURCE OF REAL PROFIT

AGGRESSIVE PRODUCERS LIKE Riverside Sand & Gravel Co., Thiensville, Wis. — Consolidated Rock Products Co., Brooksville, Fla. — W. P. Rose, Goldsboro, N. C. — Consolidated Quarries of Georgia — Georgia Mineral Products Co., Tate, Ga. — are converting their surplus sand into profits. Aggregate made into these modern units sells up to $12.00 per ton.

DUNBRIK AND DUNSTONE fulfill all the demands of modern building requirements — lighter weight — accuracy — greater strength — standard size brick and multiple sizes up to 12 brick and their mortar joints. And all can be produced in a complete range of colors, shades and textures.

WE EQUIP YOU with new and revolutionary line production machinery, permitting large production with only one or two men. Equipment costs but a fraction of what would be required for other processes of equal capacity.

INVESTIGATE. Write today and ask for "4 Keys to Manufacturing Success."

W. E. DUNN MFG. CO.

420 W. 24th Street HOLLAND, MICH.

5 SMITH-MOBILES are Mixing Concrete for large Chicago U.S.H.A. Project!

And here are some reasons why —

1. High discharge makes possible discharging into portable 2 cu. yd. hoppers, for cart delivery, without using ramps or rear end hoists.
2. Feed chute charging, with no hatches to open or close, saves several minutes charging time per batch.
3. Efficient end-to-end mixing action insures uniform, well-mixed concrete on the unusually short hauls.
4. Visible Mixing permits visual inspection before discharge.
5. Fast discharge without segregation. Batch is discharged in about 45 sec.

• • •

That Thompson-Starrett Company, Inc., were wise in selecting SMITH-MOBILE Truck Mixers for this job is reflected in the fact that all five machines have been working steadily, for five months, *without a single mechanical failure.* Although the longest haul from the batching plant is only five city blocks, the strength of the concrete consistently exceeds the designed strength by 20%.

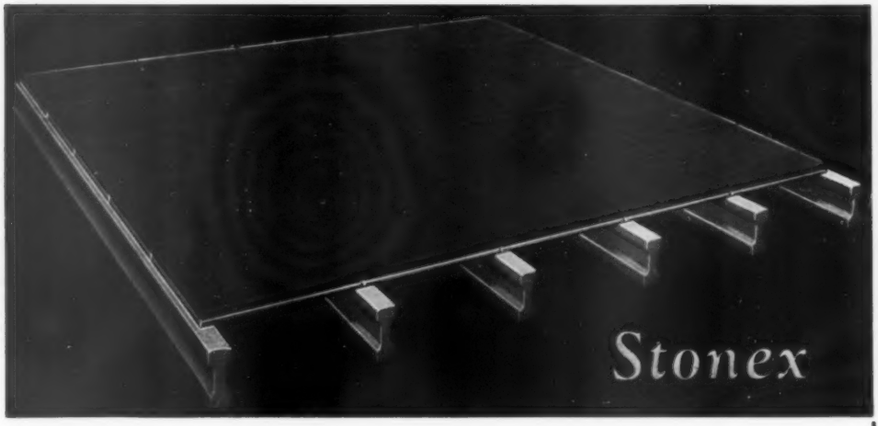
Write today for catalog.

THE T. L. SMITH COMPANY
2887 N. 32nd St. • Milwaukee, Wisconsin

SMITH-MOBILE THE *Modern* TRUCK MIXER and AGITATOR

A 3025-½H

HERE'S A NEW *LOW-COST* CONCRETE FLOOR



Here is a practical answer to the question "How can we get a good low-cost, finished concrete floor?

Precast concrete joists open the door to the low-cost floor market. STONEX clinches the sale by solving the problem of a floor finish.

The illustration above shows how simple the tile are to place . . . the speed with which a floor can be completed . . . the distinctive result that is obtained, at an amazingly low cost.

The new and exclusive STONEX process enables products manufacturers to produce—at low cost—tile of all shapes, sizes, and for all purposes . . . tile that are harder than granite, as proved by laboratory tests . . . in beautiful colors; all shades, tones and blends, that are an integral part of the tile itself.

The system has been perfected and proved by test and job experience. It is all ready for alert products manufacturers to merchandise. It is just what you need to win your local floor business.

Write today for more details about STONEX process and our plan to license manufacturers to make and sell this system

STONEX INDUSTRIES, 210 Seventy-First Street, Miami Beach, Florida

Every SAUERMAN installation cuts material-handling costs!

The best assurance for greatest profits in digging and hauling loose materials (sand, gravel, loose rock and stone, aggregate, ore, coal, etc.) is to apply SAUERMAN economy to every long range job.

With a SAUERMAN Power Drag Scraper or Cableway Excavator you can actually handle tons for pennies—can move 10 to 1000 cu. yds. per hour over 100 to 1500 ft. spans. Operating with equal efficiency under various digging conditions, the ready adaptability and versatility of a SAUERMAN Machine makes it ideal for any long range job where materials must be dug, hauled and dumped.

Pictured at right is a typical small SAUERMAN Drag Scraper moving material from a glacial gravel bank to a screening plant.

SAUERMAN *Long Range* MACHINES

Write for Catalog!

SAUERMAN BROS., Inc.
434 S. Clinton St., Chicago, U.S.A.

QUINN PIPE FORMS

HAND or WET PROCESS

Make concrete pipe on the job with *Quinn Pipe Forms.* Quinn Pipe Forms can be handled by less experienced labor and produce uniform concrete pipe of highest quality. The recognized standard of all concrete pipe.

HEAVY DUTY CONCRETE PIPE FORMS

Built to give more years of service—sizes for any diameter pipe from 12 to 84 inches—tongue and groove or bell end pipe — any length. Backed by years of service in the hands of contractors, municipal departments and pipe manufacturers.

NEW MEDIUM DUTY CONCRETE PIPE FORMS

Meet the demand for low cost equipment that produces a uniform quality of pipe in smaller amounts. Complete in every way. Stands up on any job. Same sizes as "Heavy Duty," from 12 to 84 inches—any length.

Write Today

Get complete information on prices and Special Construction features of Quinn Pipe Forms. Give us size of job for estimate on your pipe form needs.
Also manufacturers of concrete pipe machines for making pipe by machine process.

QUINN WIRE & IRON WORKS
1627 TWELFTH ST., BOONE, IOWA

INFRINGEMENT NOTICE

To Builders and Users of Block Machines:

Please take notice that the Stearns Manufacturing Company of Adrian, Michigan, are the sole and exclusive licensees of "Joltcrete" vibration block machine patents and patent rights and have the sole and exclusive right to manufacture and sell such equipment.

At the present time there is a suit for patent infringement pending against H. W. Bell Company of New York City, a user of infringing equipment.

Others manufacturing infringing equipment and the users of such equipment will be prosecuted to the fullest extent of the law.

LOUIS GELBMAN, *Inventor*

Concrete Silos STAVE OR MONOLITHIC

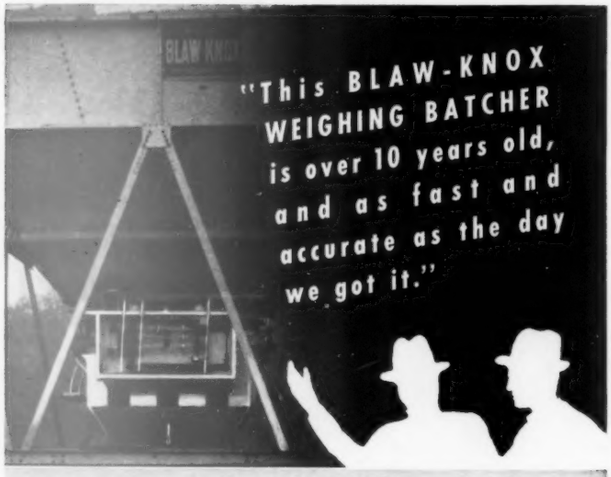
for Concrete Products, Sand, Gravel, Stone Plants

Concrete-products manufacturers like the Columbia Concrete Products Co., Toledo, find that concrete stave storage silos stop aggregate waste, reduce handling costs and serve admirably to advertise the firesafety, permanence and adaptability of concrete units in general. Consult us about your storage problem.

NEFF & FRY CO.

CAMDEN, OHIO

"I'm probably the youngest shovel operator that ever swung a dipper stick — but already PIT AND QUARRY is my favorite magazine."



Built for maximum speed and accuracy in measuring AGGREGATES, CEMENT AND WATER, Blaw-Knox Weighing Batchers are standard equipment in widespread use by road contractors, for general construction, material yards, and ready mixed concrete plants. They satisfy all modern specifications. Furnished for manual or automatic operation.

The reliability of Blaw-Knox Weighing Batchers is acknowledged by thousands of users. Send for catalog No. 1566.

18

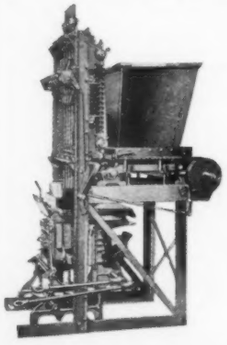
BLAW-KNOX BLAW-KNOX DIVISION OF BLAW-KNOX CO. Farmers Bank Bldg. Pittsburgh, Pa.

Weighing Batchers

Miles CONCRETE EQUIPMENT

INVESTIGATE BEFORE YOU BUY

the PIONEER EQUIPMENT of the industry, not an experiment, but a proven success with which you are assured a larger production of high quality blocks at both a lower first cost and a lower operating cost, facts well worthy of your serious consideration.



WRITE FOR CATALOG

THE MILES MANUFACTURING CO.

Dept. 20

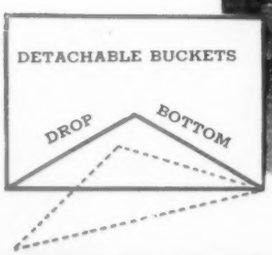
JACKSON, MICHIGAN

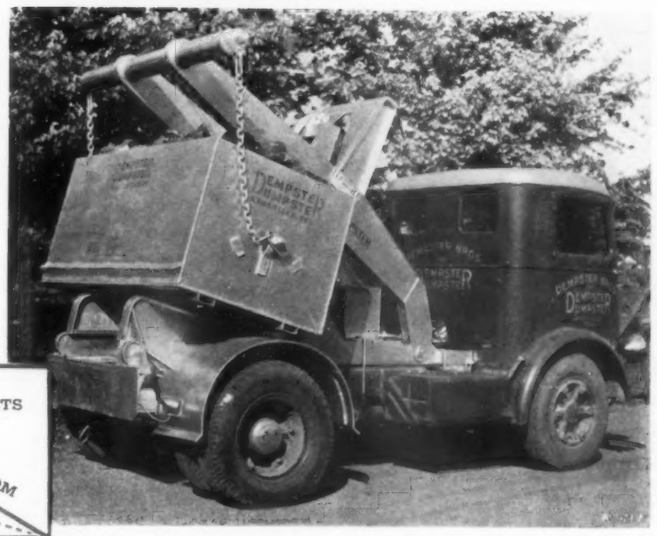
DEMPSTER DUMPSTER

Tough-Task Giants

Tough tasks and heavy-duty service are accomplished with ease by DEMPSTER-DUMPSTER Models 300LF and 400LF—the rugged giants of the DEMPSTER-DUMPSTER line. A single unit serving as many as ten detachable buckets, each up to 6 cubic yards in capacity, does the work of five trucks at far lower cost. Simply constructed of the most rugged materials available, DEMPSTER-DUMPSTERS have served faithfully year after year in many operations without a major breakdown. Write for the facts today. Just ask for Bulletin No. 501.

- No High Pressure Hose
- No Counterweight
- No Auxiliary Jacks



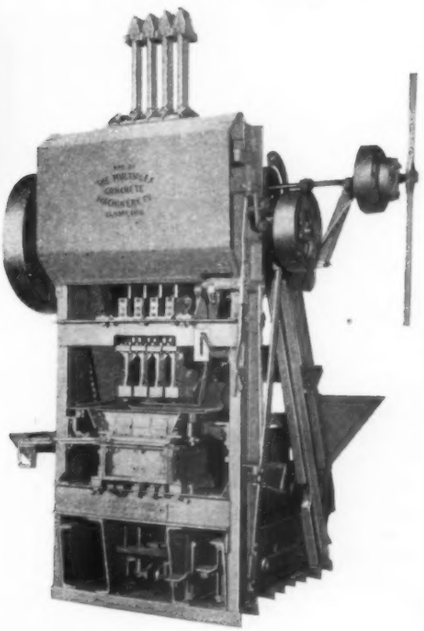


Above is Model 300 LF (3 cu. yds. water level).

DEMPSTER BROTHERS, Inc. KNOXVILLE, TENNESSEE

WE FEEL LIKE THIS about our new Concrete SUPER TAMPER with 8-bar tampers

Hurrah! It's a MULTIPLEX



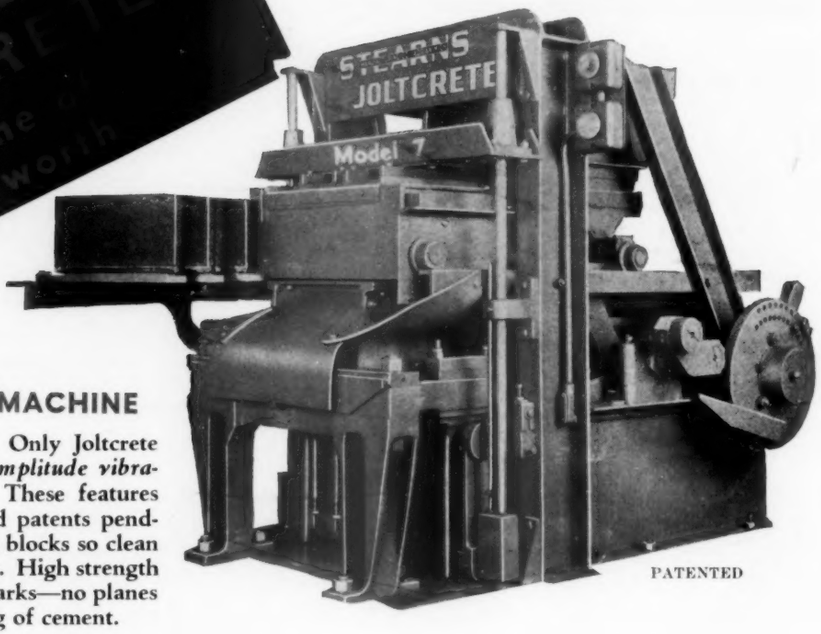
WE'RE RECEIVING CONGRATULATIONS from enthusiastic concrete block producers, who are hailing this new member of the MULTIPLEX family — our Super Tamper with 8-bar tampers.

The machine is super modern in every detail, and designed and constructed to produce top quality block units on a minimum cost and maintenance basis. Runs quietly and with little vibration. Has position-timed feeding and stripping, and quick action 5 point clutches. Handles all kinds of aggregates. Capacity 4 to 6 units per minute—no waiting between operations.

Send for our Catalog, with full information about MULTIPLEX money-making equipment, including the Multi-Mixer for faster and more thorough mixing of any concrete batch.

The *Multiplex* CONCRETE MACHINERY CO. ELMORE, OHIO

Stearns Joltcrete operates automatically. Made in three sizes with capacities up to nine 8″ blocks per minute. Uses your present cored pallets or inexpensive new ones. (Ask for pamphlet "The Advantages of Cored Pallets.")



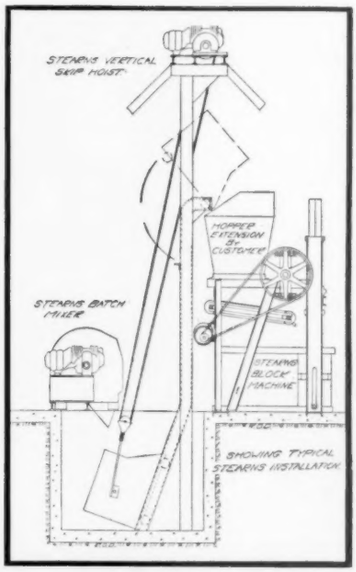
PATENTED

STEARNS JOLTCRETE MACHINE

Only Stearns makes Joltcrete. Only Joltcrete subjects the concrete to *limited amplitude vibration—vibration under pressure.* These features are covered by broad patents and patents pending. And no other process makes blocks so clean cut, true-to-size, uniform in texture. High strength —low absorption. No core bar marks—no planes of weakness. More blocks per bag of cement.

STEARNS CLIPPER STRIPPER

Ideal for small plants and, in batteries, achieves low production costs in large plants. Eight bar tamping produces dense, uniform blocks, increases block yield per bag of cement. Available in four models, with down-face, rock face and brick attachments available.



STEARNS SKIP LOADERS

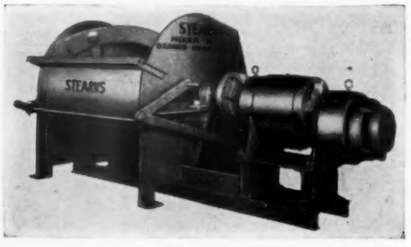
for charging dry materials into elevated mixers or for elevating mixed concrete to feeding hoppers. Independent and mixer drive types. May be used with any make of mixer. Proper track and cable lengths permit wide range of application.

STEARNS MIXER

The mixer with interchangeable, renewable, bar type liners of tough, abrasion resisting steel. "Sterloy" ribbon blades. Heavy steel shell electrically welded to steel ends. Quick opening, tight locking door. Low charging height. Large ball bearings perfectly shielded.

Pulley, V-Belt or Gear-Head Motor Drive. Skid or truck mounting.

Five sizes—3, 12, 18, 28 and 42-ft. *Prompt shipment from stock.*



Complete Concrete Products Plant Equipment

STEARNS MANUFACTURING CO. • ADRIAN, MICH.

Write for folders on the machines you are interested in

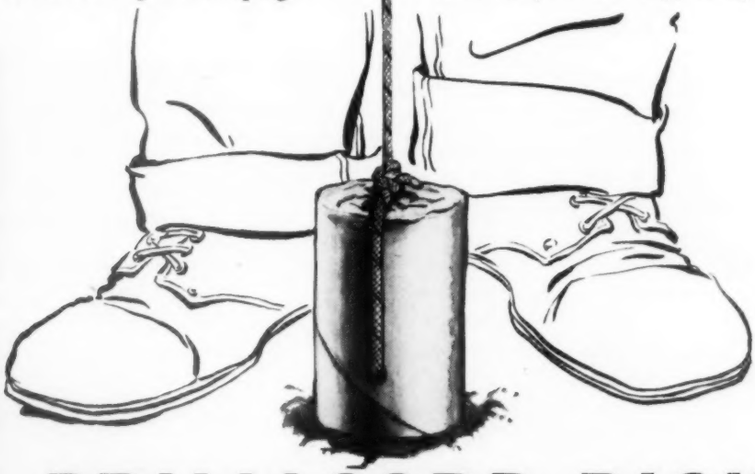
LOAD THE BORE HOLE *right*

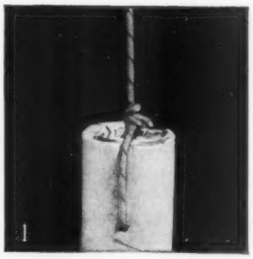
Loading is safer, quicker, simpler when you use Primacord, for no blasting cap is required in the bore hole.

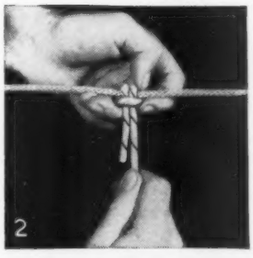
Lower a properly laced cartridge slowly and smoothly to the bottom of the hole. As soon as it reaches the bottom, cut the Primacord from the spool, allowing proper length for joining to the main line. Draw the fuse taut and secure with a stone for the rest of the loading and tamping.

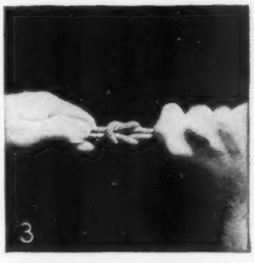
Deckloads are extremely simple. The Primacord loads from top to bottom of the bore hole through all deckloads.

The Primacord Booklet gives full information on the use of this modern, instantaneous blasting fuse. Send for your free copy today.









PRIMACORD·BICKFORD

Detonating FUSE

THE ENSIGN-BICKFORD CO., Simsbury, Conn.

Makers of Cordeau-Bickford Detonating Fuse — and Safety Fuse since 1836

PB23

1. Tie through cartridge.
2. Half hitch branch to main line.
3. Connect main line lengths with square knot.
4. Fuse and cap on end of main line.

IMPORTANT: Branch lines should lead away from main lines at *right angles*. Avoid kinks and small loops.

5 big features *make this* Industrial Advertising Conference *a "must" for you!*

"CLINICS" . . . informal group discussions of "Tying in Advertising with Selling," "Getting Salesmen's Cooperation," "Direct Mail," "Measuring Results," "Market Information," "Copy Testing," "Programs that Management Will Approve," "Layout, Copy and Illustration," "Allocation of Budgets" and other problems. *Inside information on successful methods and campaigns,* and an opportunity to have *your questions answered.*

ADVERTISING DISPLAY . . . direct mail, publication ads, sales literature and company magazines that are being used by hundreds of large and small industrial advertisers. Awards for outstanding work. *Stimulating source of new ideas.*

GENERAL SESSIONS . . . led by national authorities, on current industrial advertising and sales developments. Enable you to *keep abreast of trends that affect your business.*

RELAXATION . . . annual banquet, show, and dance . . . publishers' reception . . . opportunity to visit friends . . . program for wives, including trip through Ford's Greenfield Village.

CUSTOMER CONTACTS . . . you can visit important customers in Detroit plants, see your company's products being used, get first-hand reactions to advertising, take photographs for use in your 1941 advertising and sales promotion.

GOING TO BUY A NEW CAR? — You can save money by taking delivery in Detroit and driving it home.

Markets and selling conditions are changing. But profitable sales await those alert companies who study the trends and improve their practices. At this Conference you will get new ideas that will help you do a better, more efficient job, and make your 1941 advertising and sales promotion program more effective.

All Industrial Advertising and Sales Executives Are Invited

If your company sells to other business organizations, rather than to the general public . . . you will find this Conference devoted 100% to ***your*** problems. You are invited to attend, whether or not you are a member of N. I. A. A.

Write now for program and advance registration form, to Mr. Henry Doering, Registration Chairman, Truscon Laboratories, Inc.; Box 69, Milwaukee Junction P. O., Detroit, Mich.

Advance Registration Saves You Time and Trouble

No waiting to register . . . your Conference and hotel registrations will be made in advance . . . card, badge, program and room key ready when you arrive—pay $10 Conference fee and go directly to your room or to first meeting.

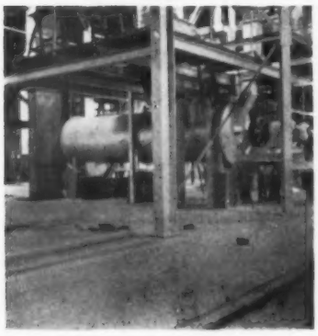
18th Annual **CONFERENCE** *and Exposition*
National **INDUSTRIAL ADVERTISERS** *Association*
SEPT. 18, 19, 20 . . . **DETROIT** . . . HOTEL STATLER

KUNTZ equipment makes this new $150,000 lime plant a standout operation. Output includes a complete line of cement products. Kiln capacity 40 tons per day.

CUMMER LIME & MFG. CO., KENDRICK, FLA.

KUNTZ SYSTEM LIME PLANTS

HAWAIIAN GAS PRODUCTS CO. HONOLULU



KUNTZ installed a standard combination-fired lime kiln in this plant, which supplies U. S. Army and Navy with oxygen and acetylene for welding. Also services Island refrigerator trade with liquid CO_2 and dry ice. Second KUNTZ kiln furnished in April, 1939.

OREGON LIME PRODUCTS CO. WILLIAMS, ORE.

The KUNTZ System of lime manufacture has made major contributions to the efficient and profitable operations of producers throughout the industry.

The KUNTZ Automatic Continuous Lime Kiln is replacing the rotary type and vertical shaft type kilns which are more expensive to run and uncertain in quality of product.

The KUNTZ gravity system of lime hydration is the only process which permits the sale of hydrate line at raw lime prices.

Make KUNTZ engineers prove their claims to leadership—in your plant!

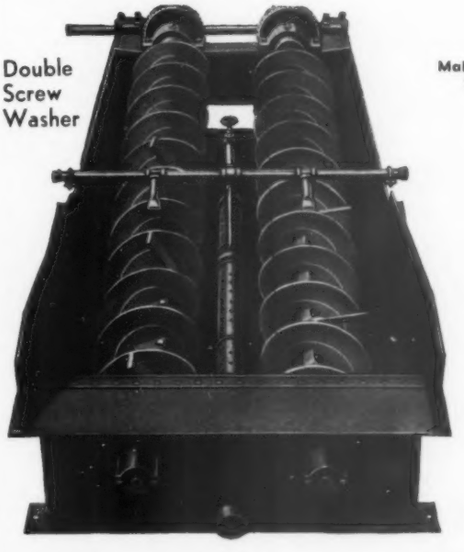
LIME & HYDRATE PLANTS CO. P. O. BOX 574 **Works: York, PA.**

EAGLE SAND and GRAVEL WASHERS Really Clean Up on the Job

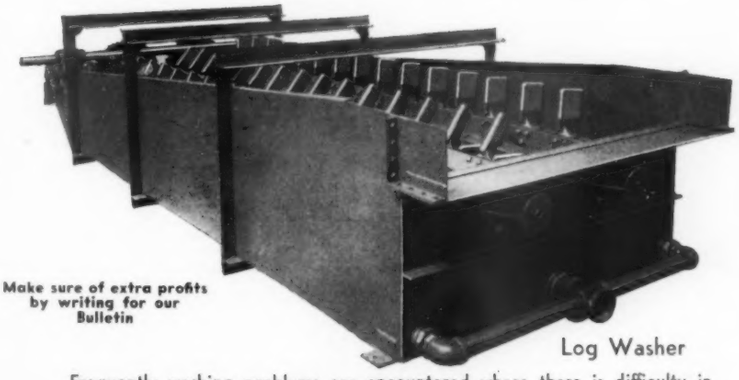
EAGLE Washers have set the pace for many years in the sand and gravel industry. They are designed and constructed to do a quality job. Exclusive and patented features insure record operating economies, as attested by producers throughout the United States.

EAGLE Spiral Screw Washers are recommended for all material of lighter specific gravity than the aggregate. Furnished with single or double screw, and various diameters.

Double Screw Washer



Make sure of extra profits by writing for our Bulletin



Log Washer

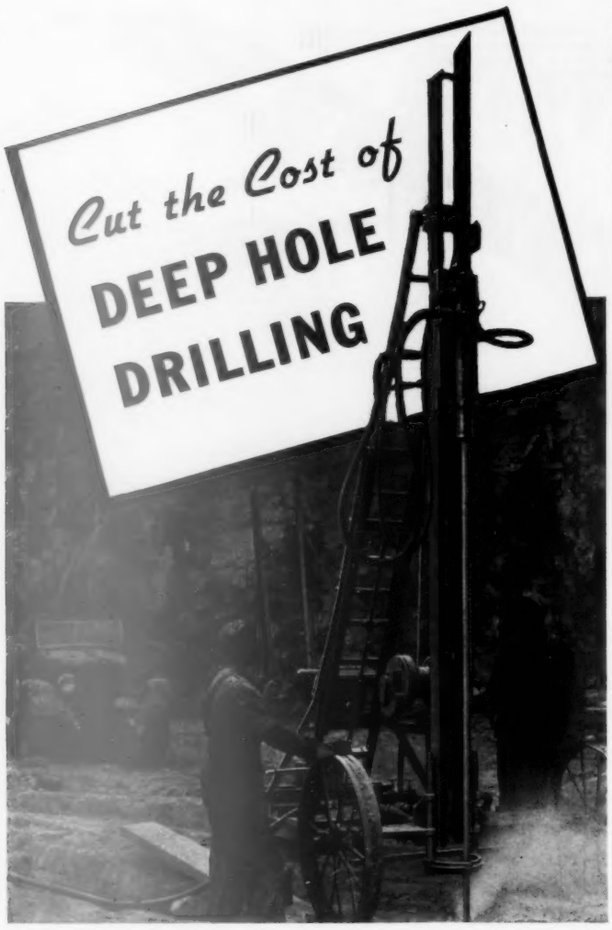
Frequently washing problems are encountered where there is difficulty in breaking down refractory materials such as tough clays or conglomerates. EAGLE Paddle type Log Washers of proper length give complete satisfaction in handling aggregates of this description. They have also been used extensively in washing various ores.

Standard machine is Double Log type. We will quote on single log machine on application.

EAGLE Products have enjoyed an enviable—and deserved—reputation since 1872. They include: EAGLE Double Roll Crusher, Shale Planer, Sand Drag, Sand Tank, Dry and Wet Pans, Specialized Mining Equipment, Olsen Self-Dumping Cages, and the famous ***Swintek*** Chain Type Screen Nozzle Cutter which has revolutionized dredging operations.

An investigation of EAGLE equipment will cost you nothing—and assure better operating profits.

EAGLE IRON WORKS Des Moines, Ia.



In any class of rock excavation where holes in excess of 20 feet are required you can materially reduce the time—and cost—of drilling with a CP G-100 Wagon Drill. Quickly moved from hole to hole, or readily converted from wheel to skid mounting.

Any CP Drifter can be used with the G-100 Wagon Drill, but the 4-inch CP-70 is particularly recommended because of its high drilling speed, strength of rotation, hole cleaning capacity and adaptability to practically all kinds of formations.

For complete details write for Bulletin No. 873

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 6 EAST 44th STREET, NEW YORK, N. Y.
Sales Offices and Service Stations Throughout the World

CP WAGON DRILLS

No Chips, No Slivers with an AMERICAN on the Job!

An AMERICAN installed in your plant is definite assurance that your product will be uniform, cubical and free from chips, or slivers. These powerful crushing units, built in capacities from 10 to 100 tons per hour, are economical to operate and run up no expensive repair bills. Write for further details without delay!

AMERICAN PULVERIZER CO.
1289 Macklind Ave. St. Louis, Mo.

Confucius say:

PIT & QUARRY
CARRY MOST
ADVERTISING
BECAUSE
PIT & QUARRY
REACH MOST
PROSPECTS

TRAYLOR "TY"

REDUCTION CRUSHER

Based upon the number of Traylor Type TY Reduction Crushers placed in operation during but a few years, and the many—very many—unsolicited expressions of satisfaction sent us by users, we feel safe in saying that no crushing machine has ever registered so great a success. There can be only one reason for this—the TY fills a definite need, and performs in a manner meeting the purchaser's expectations. Our Bulletin No. 2112 contains all of the "whys." Send for a copy today.

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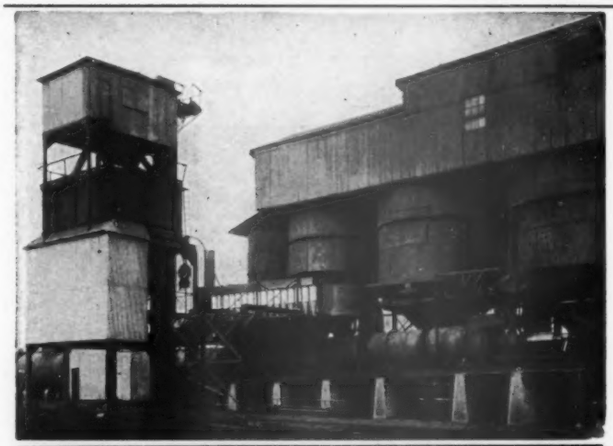
Export Department—104 Pearl St., New York City. Foreign Sales Agencies: London, Lima, Sao Paulo, Rio de Janeiro, Buenos Aires, Santiago, Valparaiso, Antofagasta, Oruro



WARREN ASPHALT PLANTS
HOT MIX —— COLD MIX
— OR —
COMBINATION UNIT FOR BOTH TYPES

CAPACITY, DESIGN AND ARRANGEMENT TO MEET ANY REQUIREMENTS

Designed and Built
— By —
WARREN BROTHERS ROADS CO.
P. O. BOX 1869
Boston Massachusetts

We'll Send You "ROPE DOPE" regularly!

"Rope Dope" is *not* an advertising medium. It is a periodical bulletin which explains simply and intelligently the highly technical phases of Wire Rope—its applications and uses . . . There's no obligation on your part—but a lot of valuable information in store for you.

WIRE—WRITE—or consult your Telephone Directory.

UNION WIRE ROPE CORPORATION
2132 Manchester Ave. Kansas City, Mo.

UNION Wire Ropes
The "ULTIMATE LOW COST WIRE ROPE"

B

PAY LOADS *and* PROFITS

No ordinary buckets are the Industrial Brownhoist Clamshells. From tip to digging teeth they are as finely built as thirty years experience and modern engineering makes possible. The result . . . out on your work . . . is bigger output, lower upkeep cost and, most important, increased profits.

Your operator will get the most out of his crane when it's equipped with an Industrial Brownhoist Clamshell . . . and you'll get a bigger return on your crane investment. Complete facts are contained in Catalog 353. Want a copy?

INDUSTRIAL BROWNHOIST GENERAL OFFICES: BAY CITY, MICHIGAN
DISTRICT OFFICES
New York, Philadelphia, Pittsburgh, Cleveland, Chicago.

Crack Down on Crushing COSTS

with the super-duty Roller Bearing DAY Crushers and Pulverizers. Wide range of sizes available.

Ask for Bulletin

"You Can't Go Wrong in a Day"

Made by the builders of the famous Brooks LOAD LUGGERS

10 x 20 Jaw Type CRUSHER

BROOKS EQUIPMENT & MFG. CO.
KNOXVILLE, TENNESSEE

SUPER-LOY
WOVEN WIRE SCREENS
LUDLOW-SAYLOR
WIRE CO. ST. LOUIS

12 HUSKY MODELS TO MEET YOUR NEEDS.

CUT PIT COSTS

with economical, efficient equipment

The heavy duty features and many operating advantages built into these sturdy, powerful, fast, convertible shovels, ⅝ to 1¼ yards, will give you increased production at lower cost. Write for Catalog H-3.

BAY CITY SHOVELS, Inc.
Bay City, Mich.

BAY CITY SHOVELS

See WOODSTOCK TYPEWRITERS

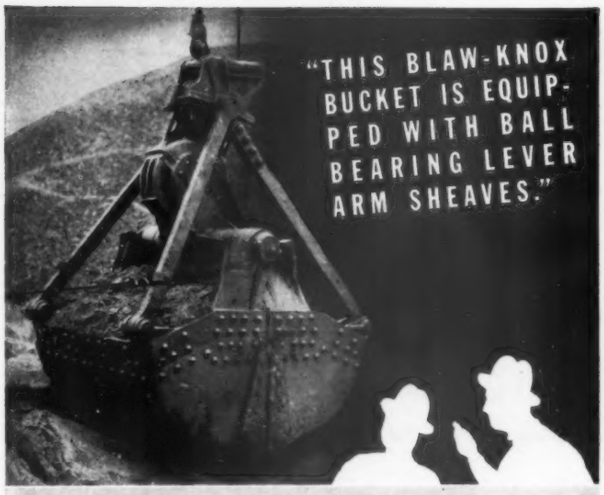
SYMONS
CRUSHERS • SCREENS

Meet today's demands for finer crushed products at lower cost by producing them with Cone Crushers.

For more accurate sizing, install the horizontal, positively vibrated, low headroom Symons Screen.

NORDBERG MFG. CO., MILWAUKEE WISCONSIN

Advertise your wants and surplus equipment in



As a matter of fact this feature is standard equipment and does not cost more. It is especially desirable where the bucket handles loose granular materials because it keeps lubrication in and dirt out. This and many other desirable features of Blaw-Knox Buckets is fully described and illustrated in Bulletin No. 1606. Write for it today.

17

BLAW-KNOX BLAW-KNOX DIVISION • OF BLAW-KNOX CO. • Farmers Bank Bldg. Pittsburgh, Pa.
Digging and Rehandling **BUCKETS**

ROBINS MAKES

Belt Conveyors
Idlers
Belts
Bucket Elevators
Screens
Screen Cloth
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Bin Gates
Hoists
Grab Buckets
and all their accessories
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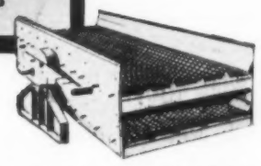

You can separate exact sizes with Robins GYREX, VIBREX and ELIPTEX Screens. Robins Screens are fast, accurate and use but little power.

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MATERIAL HANDLING ROBINS EQUIPMENT

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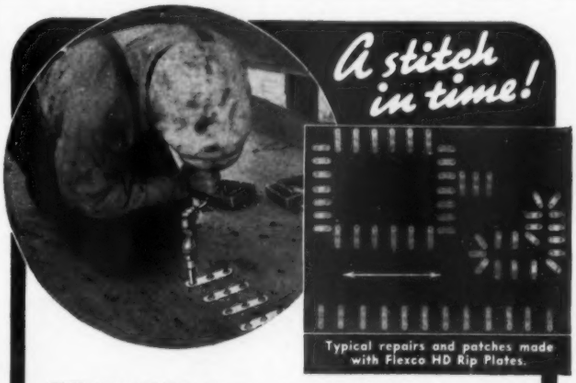
Low Cost Loading

THERE is no other method that can load bulk materials from the ground to trucks as cheaply as can the B-G Bucket Loader—in speed of loading, day-after-day capacity, and reduced truck time. The operator can move the Loader quickly and crowd steadily with a clean pickup. Why not investigate these B-G Bucket Loaders?

Q-21

BARBER GREENE
AURORA ILLINOIS



Typical repairs and patches made with Flexco HD Rip Plates.

THOUSANDS of men in industrial plants, mines and mills all over the country are doing just what this man is doing. They are cutting costs by repairing conveyor belts with Flexco HD Rip Plates.

WRITE TODAY FOR BULLETIN F-100 that shows how easy it is to repair rips, to strengthen soft spots and to put in patches by using Flexco HD rip plates. The bulletin also shows how to make tight butt joints in both conveyor and elevator belts with Flexco HD Belt Fasteners. These fasteners are made in six sizes. Furnished in special analysis steel for general use and in various alloys to meet special conditions.

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Flexco HD Belt Fastener

FLEXIBLE STEEL LACING CO.
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FLEXCO REG. U.S. PAT. OFFICE **HD** BELT FASTENERS
Sold by supply houses everywhere

Via Barber-Greenes

● Securing economical distribution and compact plant design, this Barber-Greene system of conveyors was worked out to screen into three sizes. Outstanding is the fact that the three B-G stockpiling conveyors are supported out of the pile by B-G steel A-frame supports, greatly aiding reclaimation operations.

● The reciprocating feeder, four belt conveyors, and A-frames are all B-G standard pre-engineered units, selected for this construction. Our engineers can help you with your material handling problems.

Q-26

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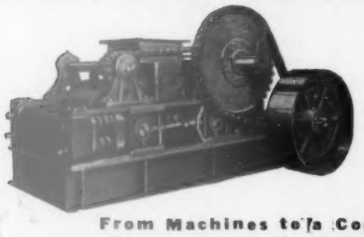
HIGH PRODUCTION--LOW POWER COST

ROLL CRUSHERS
SIZES UP TO 54 x 24



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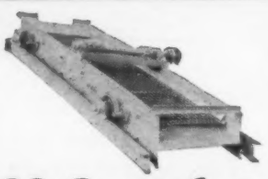
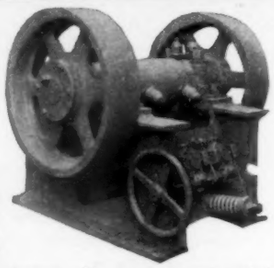
Clamshell Buckets
Portable Conveyors





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Single and double roll and jaw crushers, hammer mills, super dry pans,—steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, hoists,—complete portable, semi-portable and stationary crushing, screening and washing plants for different capacities of any materials.

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of every description
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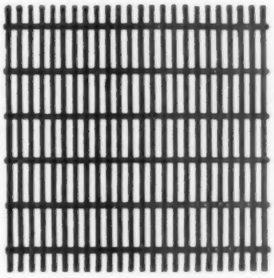

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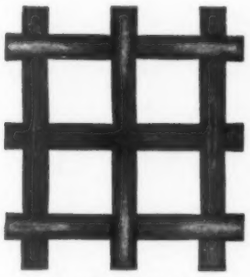
A wire cloth of guaranteed accuracy backed by fine workmanship and an effort to satisfy.

Available in Square Mesh and Rolled Slot. A trial will convince you of the superiority.



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INGERSOLL-RAND Model 425 Portable Compressor. Actual Capy. 425 FPM @ 100 lbs. Used 4 months. Half Price.
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1—10 Ton Gasoline Type, on Caterpillars.
3—20 Ton Locomotive Type, Standard Gauge.
1—30 to 40 Ton Locomotive Type, St. Ga.

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3—300 K.W. G.E. Rotary Converters.
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1—Complete Ainley Placer Gold Machine, 4 Bowl, Dragline Operation.

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4—51 Ton Baldwins, 17x24, Standard Gauge.
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1—3½ Yd. P & H Diesel 900, on Caterpillars.

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175—20 Yd. Koppel and Western, Std. Ga.

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7—Cameron, 49 to 248 G.P.M.
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1—1000 GPM, 325 ft. HD. Worthington, Cent.
4—4" Dorrco Diaphragm Pressure.

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SHOVELS AND CRANES—PRICED RIGHT!!

1—Lima Type 601 Shovel, Serial No. 370, with 23′ boom, 17′ 4½″ handle, 1½ cu. yd. bucket, powered by Waukesha Motor, Model WK-85A, Bore and Stroke 6¾″ x 8″, Serial No. 345848, complete with Leece-Neville Generator.

1—Lima Type 601, Serial No. 388, with 26′ Boom, 17′ 4½″ handle, 1½ cu. yd. bucket, powered by Waukesha Motor, Model WK-86B, bore and stroke 6¾″ x 8″, Serial No. 346236, Complete with Leece-Neville Generator and Starter.

1—Bucyrus-Erie Type 43B Shovel, Serial No. 11406, with 23′ boom 17′ handle, 1½ cu. yd. bucket, powered by Wisconsin Motor, type E, 6 cylinder, Serial No. 1193, Bore and Stroke 6″ x 7″ complete with Leece-Neville Generator and Starter.

1—P&H Type 760, Serial No. 4479, with 21′ 8″ boom, 19′ 2½″ handle 2 cu. yd. bucket, powered by Climax Motor, Model R61. No. 15211, Complete with starter.

1—P&H Type 700B Shovel, Serial No. 4466, with 26′ boom, 19′ 2½″ handle, 276422 Serial Number, Manganese Bucket Powered by Waukesha Motor, Model WK-71A, Bore and Stroke 6¾″ x 8″, complete with Leece-Neville Generator and Starter.

1—Thew Loraine Type 75A Shovel, Serial No. 3881, equipped with 21′ Shovel Boom, 18′ Dipper stick, 1¼ cu. yd. dipper. Powered by Waukesha Motor, Model S-W24B, Serial No. 158922, Bore and Stroke 5¾″ x 8″. We also have available 40′ Lattice Type Dragline Boom to fit same.

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1—P&H Model 800 Caterpillar Crane, equipped for Dragline Operation has 65′ Crane Boom and 2¾ yd. Dragline Bucket, Powered with Atlas Imperial Diesel Engine, equipped with extra wide cats.

1—Link Belt Model K2 1½ yd. combination crane and shovel, with manganese dipper stick, 60′ crane boom, 1¼ yd. digging bucket also equipped with back hoe attachment for trench work and cellar excavation.

1—P&H ¾ yd. Shovel, full revolving, equipped with 25′ crane boom, mounted on cats.

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1—Star Power Shovel ¾ yd. capacity, full revolving, mounted on full length crawlers, powered by 4-cylinder Waukesha 60 HP motor.

2—Lima Model 750 Shovels, 22′ boom, 17′ dipper handle, 1¾ yd. capacity, 2½ yd. bucket, all manganese, powered by 6 cylinder 6 x 7 Wisconsin Motor.

1—15 ton Morgan OET Crane, 250 volts, DC current, 3 motor drive 58′ 6″ span, fishbelly type, cab control, main hoist motor 25 HP, type 48-A, bridge motor 25 HP, type 48-A, Main trolley motor 5 HP, size 4-L.

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Lorain "75" Electric Shovel, 1¼ Yd., 50 H.P. electric motor. Will equip with gas or diesel engine.

Shovel Attachment for Thew-Lorain "60", with one-yard Manganese Front Dipper with Teeth.

Priced for quick sale—Special Used Equipment Bulletin sent upon request

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20′ and 32′ Bucket Elevators.
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9″x16″ Diamond bronze bearing jaw crusher, mounted on truck with 15—20 HP engine.
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No. 20 Diamond Portable Crushing & Screening Plant.

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New Dryers built for all purposes.

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50 H.P. A-C Ball Bearing Motor with Slide Rails and starter—3 ph., 60 c, 440 v. 210.00

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4—3-yard Rex Truck Mixers on Mack Trucks.
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7—4-yard Rex Truck Mixers mounted on Autocar and Mack Trucks—1937-8.
1—80 ton 2 compartment Blaw-Knox Bin.
Concrete Finishing Machine.
Rent new Diesel 315 Compressor and New Tools.

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1—30″x36″ Farrell Jaw Crusher.
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1—14 x 12 C-P Stationary Compressor with 75 H.P. Electric Motor.
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3-W Bucyrus Monighan Drag Line, 70 to 90 ft. boom. Will handle 4 yard bucket. Completely rebuilt, electrically operated, and ready to go. Priced to sell. For full specifications and price, address

BRODERICK & GORDON
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3—Duplicate 219 KVA G.E. Alternators 2400/480/240 v. 3 ph. 60 cy. 200 RPM each direct connected to 300 HP Buckeye Diesel Oil Engines. Complete. 10 years old. Perfect condition.

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5—DIRECT HEAT ROTARY DRYERS—4'6x50', double shell; 4'x60', 6'x60'.
2—5'x10' BONNOT BALL MILLS, steel Lining, with motors.
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1—8'x30" HARDINGE CONICAL BALL MILL, iron lined, with motor.
3—5'x27' TUBE MILLS, silex, with motors.
1—12' dia. DRY GRINDING PAN.
4—18 ton STEAM LOCOMOTIVES, Vulcan and Porter, 36" ga.
200—1½ yd. two-way STEEL DUMP CARS, 36" ga.
1—5 ton TRAVELING CRANE, 70' span, 300 ft. long.
1—20 ton BROWNING LOCOMOTIVE CRANE.

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5½ Ft. and 7 Ft. Fine Bowls

GYRATORY FINISHING CRUSHERS

No. 410-TZ Traylor, 4 ft. head; No. 25, No. 37, No. 49, Kennedy, all direct motor driven; 3' TZ Traylor.

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9'x160', 8'x150', 8'x125', 6'x120', 6'x60'.

ROTARY DRYERS—Direct Heat

Ruggles-Coles, double shell: 5'x26', 5'x30', 5'6x60', 80"x45', 104"x60', 104"x85'. Single shell: 4'x 30', 5'x30', 6'x40', 6'x50', 6'x60', 8'x60'.

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2 Roll and 3 Roll High Side—4 and 5 Roll Low Side: Nos. 0000, 00, 1 and 3. Beater type—Also Nos. 55, 60, 90 Imp. type.

HARDINGE CONICAL BALL MILLS

3'x8", 5'x22", 6'x22", 7'x22", 8'x30", 8'x72".

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Ball Mills: 3'x5', 5'x10', 6'x6', 6'x8'.
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Tube Mills: 3'x12', 4'x16', 5'x20', 5'x22', 5'x35'.

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10' Sturtevant; 8', 10', 12' Gayco—also 5' dia. Raymond "Whizzer" for attachment to roller mill.

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Tyler Hummer 3'x5', 4'x5', 1 and 2 decks; 4—4'x7' Leahy, two deck; 4'x8' Huron, 1 deck; 3—5'x10' Symons, 2 deck; 3—4'x7' Jeffrey-Traylor, 2 deck; also Rotex, Robinson and other makes.

SHOVELS AND CRANES

1—No. 19-B BUCYRUS-ERIE GASOLINE SHOVEL, ⅝ yd. 1939.
1—1½ yd. LORAIN SHOVEL, D-13000, Caterpillar Diesel Shovel, 1936, double drums.
1—No. 37-B BUCYRUS-ERIE DRAGLINE, new 1939. Caterpillar Diesel Motor.
1—BUCYRUS-ERIE No. 48-B DIESEL DRIVEN SHOVEL, 2 yd., full revolving. 1937.
1—2 yd. MARION No. 381 COMB. SHOVEL AND CRANE. Buda Diesel. 1937.
1—NORTHWEST 2½ yd. DIESEL DRIVEN SHOVEL, full revolving. 1937.
1—BUCYRUS-ERIE 2 yd. 50-B STEAM DRIVEN DRAGLINE CRANE AND SHOVEL. Aluminum dragline boom and little used shovel front.
1—TRUCK CRANE "Universal," 7½ ton.

AIR COMPRESSORS

1—INGERSOLL-RAND 315-A PORTABLE COMPRESSOR.
2—INGERSOLL-RAND 830 cu. ft. Air Cooled, electric driven COMPRESSORS, 100 lbs., 1939.
1—CHICAGO PNEUMATIC OCE 20x12x14 COMPRESSOR, synchronous motor.

LOCOMOTIVES

2—DIESEL DRIVEN 8 ton, 36" ga. LOCOMOTIVES, D-4400 Diesel motors.
2—DIESEL DRIVEN 4½ ton, 36" ga. LOCOMOTIVES, Buda Lanova motors.
4—18 ton STEAM LOCOMOTIVES, Vulcan and Porter, 36" ga. Near Cleveland, Ohio.

ROAD ROLLER

1—BUFFALO SPRINGFIELD GASOLINE ROLLER, with Scarifier—10 ton, 3 wheel, rear tires 24" wide, new 1939.

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REDUC. TYPE: Kennedy Nos. 25, 37 & 49. Telsmith 3-F & 40. Traylor 36" TZ, 8", 10", 12". Super. McCully 6" & 10". Newhouse 5, 7 & 10". Symons Cone & Disc, Ty. 2' to 4'.

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245 "	26″	5	1/8″	1/16″	"
906 "	24″	5	1/8″	1/32″	"
298 "	24″	4	1/8″	1/16″	"
370 "	22″	8	1/16″	1/16″	Elevator
296 "	22″	8	Friction		"
1455 "	20″	5	1/8″	1/32″	Conveyor
403 "	20″	4	1/8″	1/16″	"
1738 "	18″	4	1/8″	1/32″	"
60 "	18″	8	1/4″	1/16″	Elevator
288 "	18″	6	1/8″	1/16″	"
712 "	18″	4	1/16″	1/16″	Conveyor
1096 "	16″	4	1/8″	1/32″	"
554 "	16″	4	1/16″	1/32″	"
738 "	14″	4	3/32″	1/32″	"
288 "	14″	4	1/8″	1/16″	"
110 "	12″	8	1/8″	1/16″	Elevator
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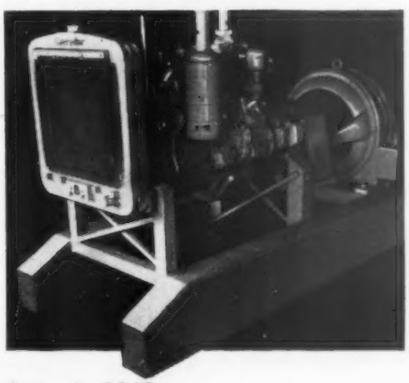

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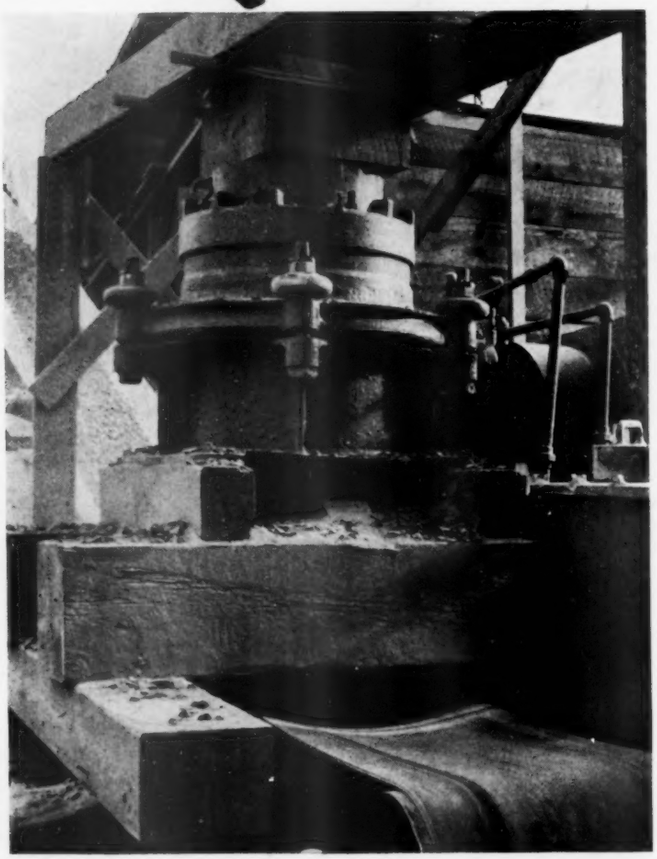

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